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# Waste Heat Utilized to Produce Electric Power

## Hot Gases From Cement Kilns Supplied to Boilers Fitted With Superheaters and Economizers—Equipment Proportioned to Use All Waste Heat to Provide Sufficient Energy to Operate Mill

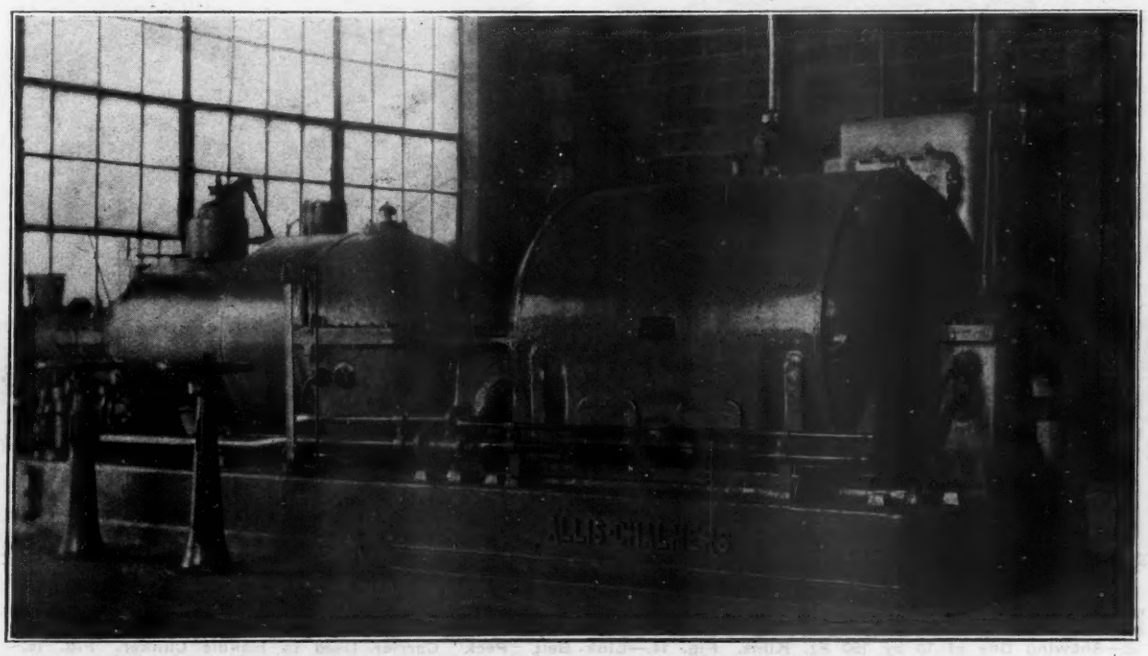
By C. H. REEDER

*Engineering Editor, Electrical Review.*

Powdered coal is used more than any other fuel in the cement industry; in fact, it is used probably more than all other fuels in cement kilns. It is also used extensively in metallurgical work and for the generation of steam power. Waste-heat boilers have been used for a considerable period of time in the iron industry and are coming into use in cement manufacturing plants. In the new plant of the Petoskey Portland Cement Co., Petoskey, Mich., in operation for about a year, both powdered coal and waste-heat boilers are used. The plant as a whole is designed so that the waste heat recovered by the boilers just about meets the power demands, the steam being utilized to drive turbogenerators supplying electrical energy to crusher, kiln and conveyor motors and to the lighting system.

Fuel is received at the plant in hopper-bottom cars, from which it is dumped into a pit below the tracks alongside of the coal pulverizing house. A conveyor carries the raw coal to a crusher, from which it falls onto a second conveyor, to be elevated into a small storage bin supplying an Allis-Chalmers coal-fired drier. This drier discharges onto other conveyors that deliver the crushed and dried fuel either to storage bins or to a conveyor feeding the three Fuller pulverizers. These storage bins also discharge onto a conveyor that empties into the one supplying the pulverizer, making it possible to take dried coal either direct from the drier or from storage.

Pulverized fuel ready for use is conveyed direct from the mill to storage bins in the kiln house, the bins being elevated above the firing floor. From these storage bins the fuel is fed by a motor-operated screw conveyor, which regulates the



• Fig. 1.—View in Turbine Room, Showing One of the Turbogenerators and the Feed-Water Heater.

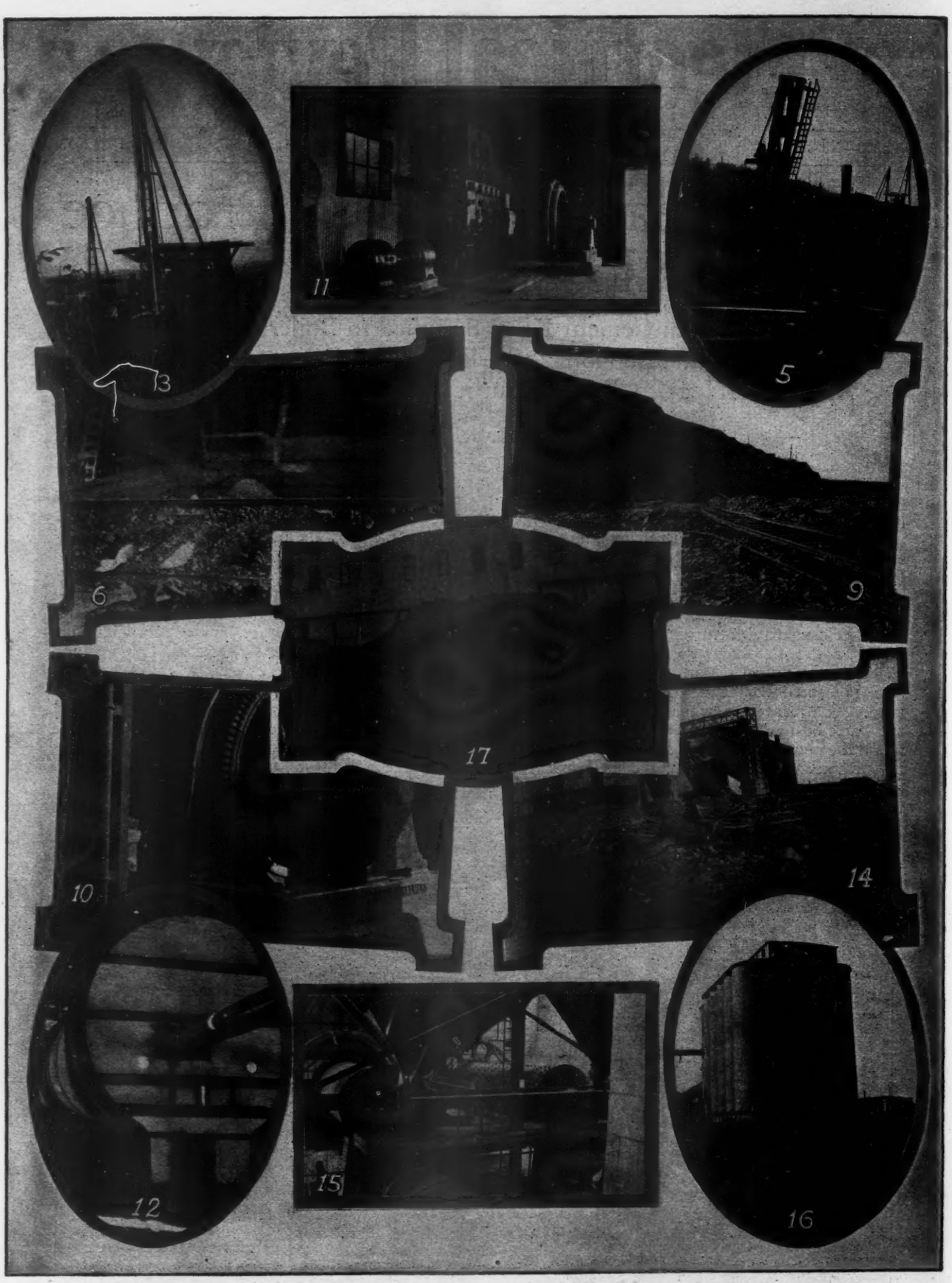



Fig. 3.—Clipper and Cyclone Drills at Work. Fig. 5.—Loading Stone With a Vulcan Shovel. Fig. 6.—Allis-Chalmers No. 12 Gyratory Crusher. Fig. 9.—Face of Quarry of Petoskey Portland Cement Co. Fig. 10.—Synchronous Motors and Cutler-Hammer Clutch. Fig. 11.—This Synchronous Motor Used to Drive the Finished End of Mill. Fig. 12.—Showing One of 10 by 150 Ft. Kilns. Fig. 14.—Link-Belt "Peck" Carrier Used to Handle Clinker. Fig. 15.—Compeb Mills Used for Finishing Cement. Fig. 16.—Bins Are 32 Ft. in Diameter and 72 Ft. High and Hold 100,000 Barrels of Finished Cement. Fig. 17.—Kiln Dust Recovered From Chamber Immediately Back of Kilns.

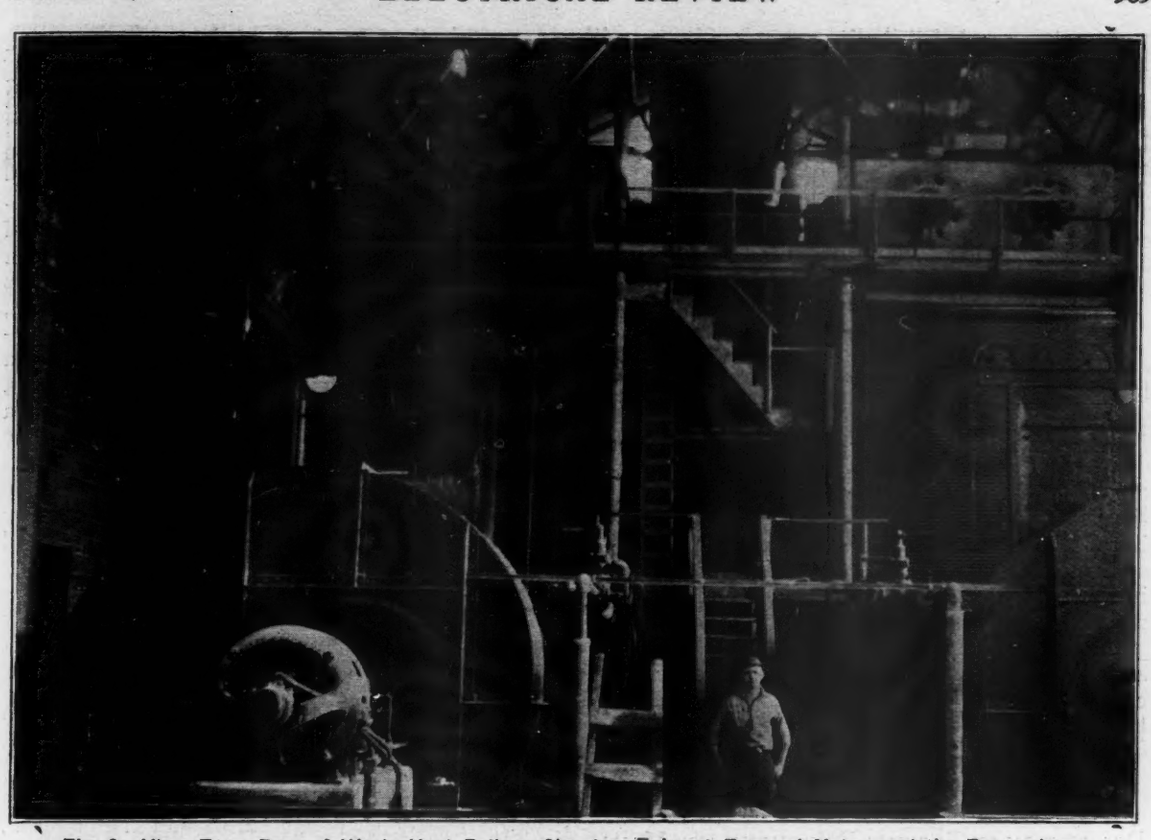


Fig. 2.—View From Rear of Waste-Heat Boilers, Showing Exhaust Fan and Motor, and the Economizers.

rate of supply, to a point where it is taken up by an air conveyor and carried into the kiln and burned. The fuel as used is ground to pass from 92% to 94% through a 100-mesh screen, the average moisture content for a typical day being 0.5%, according to results of regular tests made by the plant chemist. All hot gases discharged from the kiln pass into a settling chamber where their velocity is reduced and their direction of travel changed to eliminate as much of the suspended dust and ash as possible. A second passage beyond the settling chamber connects through dampers to both settling chambers and to the first pass of each of the two waste-heat boilers—there are two kilns and two waste-heat boilers of equal size throughout. An economizer is installed between the last pass of each boiler and the exhaust fans which discharge into a concrete tunnel breeching leading to the stack.

### Details Relative to the Steam Generating Equipment.

As has been previously stated, there are two waste-heat boilers in this plant. They are of the Edge Moor water-tube type and have 6384 sq. ft. of heating surface to each unit. Foster superheaters, having 756 sq. ft. of heating surface, and designed to supply 100 deg. F. of superheat, are built into the settings of each boiler. The economizers are of a special Green horizontal type and have 2142 sq. ft. of surface. A special arrangement of economizer tubes and cleaning holes makes it possible to blow the accumulation of dust down into bins below the floor, using a hand lance inserted through the economizer roof.

The boiler setting measures 24 ft. 4.75 ins. from the floor to the center of the drum and is 12 ft. 4.5 ins. wide and 23 ft. 8.5 ins. long. The front header is 10 ft. 3 ins. above the floor, and the back header is 8 ft. 6 ins. above the floor. The tube bank is 10 ft. high by 9 ft. wide and contains 290 tubes, 4 ins. diam. and 20 ft. long. There is a space of 540 cu. ft. beneath the first tube pass—what would be the combustion space in an ordinary boiler—360 cu. ft. of this space being effective, with the remainder reserved for the collection of additional dust. Vertical baffles divide the tube bank into four passes so that the final discharge is downward to the economizer.

Observations taken over a considerable period of time indicate an average temperature of gases leaving the kilns of 1100 deg. F., and leaving the economizer of 390 deg. F. These same observations show an average feed-water temperature between the economizer and boiler of 335 deg. F., the temperature of feed-water entering the economizer being approximately 200 deg. F. The records also show an average of 35,000 lbs. per hr. of water fed to the boilers during 4 mo. of operation. Slack coal is used having a heat content of 12,780 B.t.u., a day's requirements being from 130 to 150 tons. An average over a period of time shows a use of about 128 lbs. of coal per barrel of cement made with 1 day's continuous operation showing a production of 2250 bbls. Steam pressure is maintained at 175 lbs., with a temperature of 510 deg. F. at the superheater discharge.

Tests of the gases at various points in their travel shows an average of 27.5% $CO_2$ at the end of passage through the kiln, and 18.7% $CO_2$ at the entrance of the exhaust fan, the difference being accounted for by leakage of air into the settings. The high values of $CO_2$ obtained are, of course, not attributable to the ordinary reaction of combustion as met with in regular boiler practice,

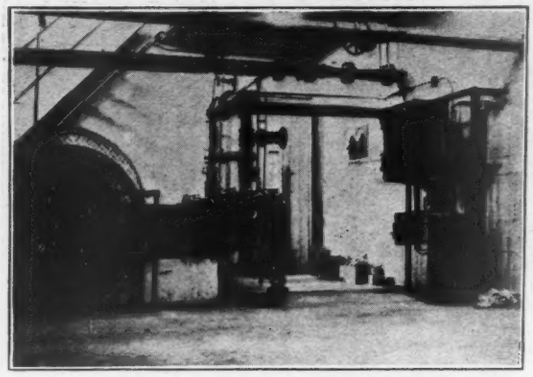


Fig. 4.—Motor-Operated Air Compressor in Basement Below Turbine Room.

a portion of the $CO_2$ resulting from the action of the heat on the materials fed into the kiln to be burned into cement clinker. The change in $CO_2$ content indicates a considerable infiltration of air in spite of the fact that great care is exercised in maintaining the settings in a tight condition to withstand the draft, which is maintained at about 4.3 ins. of water at the fan. Under the general conditions above described it is estimated that a boiler capacity of 1160 hp. is developed, 903 hp. of which is required to operate the cement plant. The difference between these two figures represents the capacity used in the power plant itself.

### Description of Turbine Equipment and Main Switchboard.

Two Allis-Chalmers turbogenerators, rated at 1000 kw. at 80% power-factor, convert the steam generated in the boiler plant into electrical energy for use about the mill. These machines, one of which is shown in an accompanying illustration, operate at a pressure of 2300 volts, generating 3-phase, 60-cycle energy for direct distribution to the larger motor equipments. Excitation for the generators is provided for by a motor-generator set and a 6-kw. steam-engine driven unit, both installed in the turbine room. The turbines discharge into Allis-Chalmers jet condensers, water for which is obtained and disposed of through two 350-ft. pipe lines 24 ins. diam., running out into Lake Michigan—the plant is located in the quarry along the shore of the lake. The pumps serving the condensers are driven by direct-connected 20-hp., 1160-r.p.m. motors.

Panels are provided on the switchboard for the exciter, the main units, the high-voltage circuits, and also for the 440-volt general power circuits.

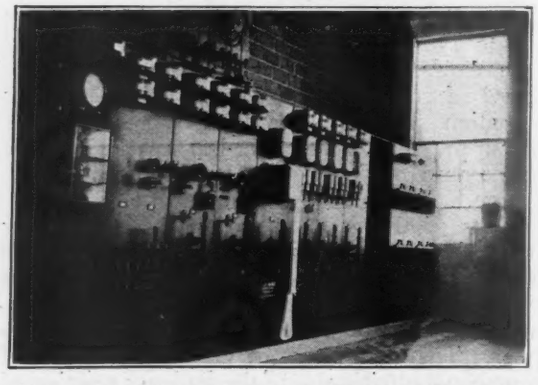


Fig. 7.—Switchboard Located in Corner of Generator Room.

Roller-Smith indicating instruments and Westinghouse watt-hour meters are used on the board. General Electric relays and oil switches are used on the high-voltage sections of the board. All power circuits in the mill are operated at 440 volts, 3-phase, except those to four 400-hp. synchronous motors driving compeb mills, one 400-hp. induction motor driving the rock crusher and two 75-hp. slip-ring motors driving the exhaust fans on the economizers. These seven motors are supplied with energy from the main bus, while all others (about 40 in number) are supplied from the 440-volt bus which is fed by a bank of transformers connected to the main bus.

Records from the watt-hour meters showed a total output of the plant for one day of 36,000 kw-hrs. The raw grinding mill used 12,300 kw-hrs., the clinker mill used 11,700 kw-hrs., the economizer motors used 1900 kw-hrs., the crusher used 900 kw-hrs., and the 440-volt system used 9300 kw-hrs., according to the records. Energy for lighting is taken from a 110/220-volt transformer. Type C lamps in RLM reflectors supply general illumination. Outlets are provided at various points for extension light connections where they may be required.

A spare Edge Moor boiler of 300-hp. capacity is installed in an annex to the main boiler house to be used in case of an emergency, or when more steam is required than the main boilers can provide. This boiler is hand fired with crushed coal, but is not called upon for very heavy duty except in rare cases. The management appears to be well pleased with the entire equipment as installed. While, as in any installation, there are small details that might be changed in future extensions that will be made, the plan as a whole is a success and the men who designed, built and are operating the plant are to be congratulated.

## SAN DIEGO (CAL.) UTILITY ISSUES EMPLOYES MAGAZINE.

The San Diego (Cal.) Consolidated Gas & Electric Co. has issued an attractive magazine for its employes under the title "Glow." The purpose of this little periodical is to present to the employes of the San Diego company educational and entertaining articles regarding business, social and sports activities throughout the company's organization. The company now has 701 employes and its properties represent an outlay of $14,500,000, the company being San Diego's largest industrial development.

The newly instituted company magazine is to be published monthly. The December issue is virtually the initial number, only one other issue, of a preliminary nature, having been previously published. It is purely an employes' house-organ, edited and managed by employes of the San Diego company and distributed among the various departments to promote interdepartmental and individual social and business relationship and to inform employes of the happenings in the different sections of the organization. The December issue contains an illustrated story about the growth of the company and a number of articles about current activities of the company. Departments are maintained for the Suggestion Box, personal references, sports and affairs of the Employes' Association.

# Plan of Fractional-Horsepower Motor Applications

## Speed and Torque Characteristics of Vital Importance in Motor Selection—Universal Motor Desirable When Conditions Permit—Attention to Detail and Standardization of Parts Brings Success

This is an era of power, man using his energy more efficiently to direct rather than to perform. It is cheaper to pay for power than to perform work by human effort. Small motors are therefore being adopted for all purposes in which human exertion can be replaced automatically. The small motor performs service out of all proportion to power cost, that cost being compared to the cost of human effort.

At first the fractional-horsepower motor was merely a smaller brother to the regular power motor, any motor rated at 0.5 hp. or less being considered as within the scope of such a designation. Growth was slow because drives were not thoroughly worked out to meet requirements and were not entirely satisfactory. Experience has taught that there is as much or more care required in designing a motor drive for a small machine as for the larger machines. The motor manufacturers have broadened their lines and have experimented to secure different characteristics and to determine the limiting features of each design. The manufacturer with a new device is no longer advised to "put on a one-eighth or one-sixth horsepower motor." An expert is sent out to see the machine in action in its field, noting all conditions affecting the drive. The device is taken to the motor factory and thoroughly tested, and from the data thus obtained a motor is selected or designed to fit the machine. This is found to be the only manner in which continued satisfaction can be assured.

### Much Detail Involved in Design of Successful Small Motor.

The successful small-motor application is a matter largely dependent upon careful attention to detail. First, in selection, every feature affecting the drive must be considered; second, in manufacture, constant minute scrutiny is required to insure uniformity of product. In designing the drive limits of variation should be established for use in subsequent inspection and test.

In the large-motor field a few standard frames and ratings are commonly carried, and these are adapted to their driven machines usually by building the machine to fit the motor or by the addition of special parts. This is practical mainly because of the fact that few motors are used for identical applications.

Fractional-horsepower motor applications are usually quantity propositions. Therefore the motor and driven machine are best considered as a whole, with a complete design worked out requiring a minimum of machine work and providing the maximum ease of assembling and greatest probability of uniform results. From a manufacturing viewpoint it is a matter of designing lines of standardized working parts which can be easily adapted mechanically to standard frames or can be worked in effectively as part of general designs. The aim is to provide as many ratings and as large a variety of characteristics as possible from standardized parts.

The great variety of applications imposes a corresponding variety of limiting features upon the motor. In one case weight may be all important, as for a portable device; again, freedom from noise is necessary, as in a piano motor; in some cases high pull-out torque is a limiting feature, as is the case with a washing machine drive where a wringer is used. Constant speed may be very important or ability to start quickly and repeatedly, and mechanical dimensions often play an important part. A minimum diameter is often advantageous because of limited space, or the over-all length may be restricted for the same cause.

### Standardization of Parts Simplifies Construction Problems.

As practically all devices driven by small motors are for general sale and distribution it is necessary to build them for all voltages and classes of current commonly encountered. In order to reduce costs of patterns, drawings and machinery, and in order to stock machines and furnish the proper motor upon receipt of the order, or to change motors when the user moves or otherwise changes his service, it is very advantageous to all concerned if motors for different currents can be supplied having the same mechanical dimensions. The more progressive manufacturers are now able to meet this requirement.

As before stated, each application has its particular specifications which must be closely followed and maintained. There may be in the factory parts for many different orders being carried through simultaneously. A tremendous amount of detail must be accurately executed to insure success. It is evident that standardization should be carried as far as possible to avoid multiplicity of specifications and to simplify inspection, as well as for reasons of economy. The fundamental purpose of design should therefore be the standardization of basic parts, and specialization in method of assembling should be provided for.

The essentials of a small motor are the stator, the rotor, the shaft, the commutator or equivalent device, the bearings and their supports. The stator and rotor are made up of stacked punchings. Here is a point in which standard parts may be variously assembled to gain flexibility of ratings and characteristics. The same punchings may be stacked "long" or "short." A difference in the stacking length will affect the shaft and

may affect the frame. If the end flanges holding the bearings in the standard motor can be arranged to fasten to the ends of the stack of punchings then the same flanges may be used for different stacking lengths. Windings must, of course, be special. Commutator or collector parts can be made standard. It is thus possible to provide a variety of characteristics and ratings from a set of standard parts by simply furnishing three or four shaft lengths and varying the winding designs.

The bearing flanges for a-c. and d-c. motors must frequently be different for the end containing the brushes or current-carrying parts. If mechanical dimensions are similar and the flanges for the two ends of the motor are made independent it is possible to use the same standard or special pulley-end flange for both a-c. and d-c. motors.

Fractional-horsepower motors for d-c. service are commonly wound for shunt, series and compound connections. Alternating-current motors are mostly single-phase and of the induction type in the larger sizes, some sort of phase-splitting arrangement being used for starting. Ordinarily a starting winding is provided which is cut out by a centrifugal switch as the motor attains its normal speed.

The winding design is largely a matter of compromise. Starting and pull-out torque, constancy of speed and efficiency, and power-factor, with the consequent heating effects, are the points commonly affected. It will be noted that heavy pull-out torque and constancy of speed over a wide range of load are obtained at the sacrifice of efficiency and power-factor. Motor *A* would, therefore, run considerably warmer than motor *B* under the same load, but would be able to carry much heavier overloads for short periods. Motor *A* would be used for meat choppers or washing machines with wringers, whereas motor *B* would be used for piano work or for washing machines without wringers. This case is illustrative of the whole matter of small-motor design where compromises are made which best meet the demands of each particular drive. It is evident that it is not sufficient to specify merely the horsepower rating and speed desired, as motors acting widely different can be furnished to meet these specifications.

Almost every device requiring a fractional-horsepower motor provides a variable load. The motor selected must be such that it will satisfactorily take care of the maximum demand which the application under consideration will ordinarily impose in actual use. As stated, the limiting factor may be pull-out demand, starting demand, low temperature rise with motor operating steadily, extreme quietness, or any one of a number of factors.

### Motors of Extremely Small Output Required in Quantities.

There are many light power devices requiring motors of very low output, portable vacuum cleaners being a notable instance of this type of device. It is impractical to build single-phase induction motors in the small sizes. These very small motors are commonly series-wound. The a-c. and d-c. motors are built from the same parts, but the windings differ in most cases. Very careful study of the load imposed by the driven device is required, since with a series motor a slight change in load causes a material difference in speed. It is difficult to build motors of this type to give consistent results within close limits because a minute variation in mechanical dimensions, such as air gap or commutator setting, causes appreciable difference in operation. A certain leeway must be allowed in the application or a percentage of motors will be returned, due to overload, heating or sparking. In many of these devices the cost of assembling and testing is a relatively large item, and if the percentage of rejections be high and many machines must be disassembled, repaired or changed and retested then the unit cost is materially increased. Hence careful inspection of all parts before assembling, and a little leeway in load range, are desirable features.

Commercial considerations have made it desirable that these small motors be universal, operating upon direct or alternating current interchangeably, since domestic users are constantly moving to new premises where different types of service may be provided, and portable tools are often shifted from one location to another. In addition to these considerations when motors are not universal dealers must stock for all currents, and the manufacturer also is hampered by a variety of windings. No strictly universal motors have as yet been developed. Some windings have been produced which will operate upon 60 and 25 cycles and direct current, but the characteristic curves differ. At the rated load the curves have a common point. These universal windings have proven satisfactory only for high rotative speeds. Low-speed motors require a stronger field, more armature turns and consequently more inductance. The low-speed motor placed on alternating current drops in speed more quickly, has little overload capacity, and is inclined to spark. Universal motors, being universal at but one point in the load curve, require that the power needs of the driven machine be accurately determined so that the universal point may occur at the corresponding output.

It is a difficult matter to provide a small series motor to operate at a moderately constant speed with load changes. Slow-speed motors are also hard to build since the large number of armature turns is productive of sparking.

A summary of the points to be considered in planning a small motor drive may be useful. Not all of the points will apply in every case, but it is well to check against them to be sure nothing is neglected that may have a bearing on the case in hand.

The motor manufacturer should be given an analysis of the device to be driven, stating its purpose, field of application and the number of sizes to be built. He should know the state of development to know whether special features for the motor or machine would be better or cheaper. He should know where the device will be installed and what the surrounding conditions will be, such as moisture, dirt or gas. He should know the amount of space the motor may occupy. He should know the class of users in order to estimate the care that will be given the finished device.

Next, it should be stated clearly just what the motor is to do, how it will be mounted, and what

means of drive will be used. If belted the pulley dimensions, belt centers and means of adjustment are important. If coupled or geared bearing service and thrust provisions should be considered.

What should the full-load speed be? How much leeway is permissible? Is particularly constant speed desired? Direction of rotation, open or inclosed, rating and continuous or intermittent service are questions to be answered. If the work is not continuous an estimate should be made of the periods of work and of rest, stating whether the motor is stopped or runs light.

The load cycle should be determined as accurately as possible. The amount of load, adjustments affecting the load and their results, and features limiting the range of load all have an important bearing. Load and service data determine the heating. The starting and working torques should be determined if possible. Many machines perform a cycle of operations requiring different torques at different periods. Some may start only at one point in the cycle; others may start at any point. If the motor may be called upon to start at the point of maximum torque that is a limiting feature.

Torque may be determined by means of a small spring balance, measuring the ounce-feet pull on the driven shaft at various points in the cycle. Measured torques are necessarily taken with the machine just moving slowly, and may not correspond exactly to running torques. In some cases, such as with fans or blowers, the starting and running torques may differ widely.

Other considerations affecting the motor selection are rapidity of acceleration required and frequency of starting. It is essential to know if there are any special considerations such as noise, magnetic effect of the motor, absence of end play at the shaft, etc., which must be taken care of.

### Good Bearings Vital to Success of Any Small-Motor Application.

Importance of bearing reliability has often been overlooked in the development of small motors. Motor characteristics may be ideal for a given service, but if the bearings fail to give lasting service the motor is practically worthless. Liability to wear is increased by the high speeds of operation, and wear due to vibration must be reduced to a minimum. The factors in motor efficiency and performance dependent upon properly maintained air gap necessitate the utmost nicety of adjustment, maintenance of true alignment and resistance to wear.

In small motors friction losses are large at best, and every reduction in bearing friction has a corresponding reduction in waste power. Smaller and lighter motors can be used with each reduction in a frictional or other internal loss. These facts become important when fractions of an inch in dimensions and ounces in weight are vital. As the motor will probably not be in skilled hands, and may stand idle for long periods, generous and dependable lubrication must be provided. The best anti-friction bearing obtainable is none too good for the fractional-horsepower motor.

Ball bearings of a high quality, and particularly adapted to this service, have been developed by several manufacturers. Bearings of different make are somewhat different in design, and some of these design differences may have an influence in the ease of manufacture and assembly of the motor. They may also determine the suitability of a given bearing for a particular application.

The whole matter of small-motor application, it will be seen, is one requiring careful study and attention to detail to insure satisfaction. It is hoped that this outline may be suggestive toward obtaining more successful small-motor drives for numerous purposes.

## BOOK REVIEWS

*In One Man's Life—Chapters from the Career of Theodore N. Vail,* by Albert Bigelow Paine. Harper & Brothers, Publishers, 1921.

The statement "He made neighbors of a hundred million people" may be taken as the keynote of the story of the career of Mr. Vail by Albert Bigelow Paine whose book has recently appeared under the announced title. Mr. Paine was particularly fortunate in being personally associated with Mr. Vail during his latter years and has intelligently, interestingly and at times dramatically told the story of the life of Mr. Vail, one of the pronounced, outstanding figures in the development of a stupendous industry—a man who had won and maintained the full confidence of the American public. The intimate, human touch which Mr. Paine has given to these "chapters" will assuredly be appreciated by all who knew Mr. Vail, one of whom writes these lines. Theodore Newton Vail was born July 16, 1845, and died April 16, 1920, at the age of 75 yrs. These chapters cover Mr. Vail's early life and struggles East and West, his successful career in the United States mail service from which he retired as general superintendent to take the position of general manager of the American Bell Telephone Co.

The formal opening of the transcontinental line Jan. 25, 1915, between New York and San Francisco is simply, yet graphically, told in which Mr. Vail, Prof. Bell, Thomas A. Watson, Chief Engineer Carty and President Woodrow Wilson participated.

An incident of Mr. Vail's far-seeing financial methods is described as follows:

> Large telephone financing was in prospect and he lost no time in its undertaking. He proposed by the sale of bonds and stock to raise at once $130,000,000. One of the directors said:
>
> "Mr. Vail, why do we need all that money now?"
>
> "Well," was the reply, "I believe when you go sleighing it is a good plan to go when there is plenty of snow. Something tells me that snow is going to be pretty scarce, by and by."
>
> He foresaw what comparatively few people then really believed—that the country was on the eve of entering the world war, when billions would be needed to equip the armies, and "snow" for corporation requirements would be scarce indeed. The new telephone securities were offered at attractive rates. Another of the directors said:
>
> "Mr. Vail, don't you think we could get more for our bonds than that?"
>
> "Yes," he said, "we might get more for some of them—possibly for all of them—but then again the sale might drag. We cannot afford at this time to have any hesitation. They must go with a rush."
>
> They did go with a rush, and thus in due and proper

season his company was equipped with money and credit for the emergencies of war. The details just set down were given to the writer by Major Higginson of Boston, and he added:

"Mr. Vail was right, of course. He was always right in such matters. He seemed to sit on a higher point of vantage than the rest of us, which gave him a longer range."

Theodore Vail was once asked what single word would express his business success. He answered:

"Well, if any one word would do it, it would be 'precaution'!"

Lord Northcliffe is quoted as saying: "Theodore Vail is the most interesting man I have met in America, and I believe by far the greatest."

Shortly before his death at Johns Hopkins Hospital, Mr. Vail speaking of his successor (H. B. Thayer, now president of the American Telephone & Telegraph Co.) said: "I have been worried for 3 yrs. over what would happen if I suddenly went out and the wrong man was put in my place. Thayer is a great comfort to me."

Mr. Paine concludes his account of the passing away of Mr. Vail in the following words: "The long journey was ended, but the great work he created remains, never to come to an end so long as men buy and sell in the market place and social life endures."—C. W. P.

## ILLUSTRATING VALUE OF ELECTRIC ADVERTISING SIGNS.

Central station companies who are endeavoring to build up their load with a minimum of expenditure are giving more and more attention to the electric sign business, its appealing features being its merchandising profit, little or no investment expenditure, continuous income and the desirability of this kind of load, which is largely offpeak.

In this connection they will be interested in the unique plan which has been adopted by the Federal Electric Co., Chicago, a large manufacturer of electric signs, to acquaint the central stations and merchants of the country with the electric sign and its possibilities. A standard, full porcelain enameled sign has been mounted on a Ford light delivery truck, as shown in the illustration. A number of trucks have been equipped in this manner and are traveling through the different sections of the country. The sign is fitted with a long cord so that it can be lighted by simply attaching to a convenient socket, and the merchant or central station man can then get a good idea as to the quality and appearance of the sign.

The sign in question is one of the principal models of the manufacturer, having been specialized in because of its low cost, neat appearance, durability and low maintenance expense.

To the merchant the electric sign is a permanent fixture which will pay for itself many times over. Each person who passes within a block of a store is a prospective customer, if the merchant can attract his attention. The electric sign affords this opportunity. It brightens up the store, attracts the attention of people for blocks around and helps to create in the minds of the public the feeling of service and progressiveness, which should naturally result in obtaining new patrons.

**Standard, Full Porcelain Enameled Electric Sign Mounted on Ford Light Delivery Truck by Federal Electric Co. for Demonstrating Possibilities of Electric Signs.**

# Highway Illumination Endorsed Where Tried

## Benefits of Road Lighting Evident to All Who Come in Contact With Trial Installation — Modern Equipment Greatly Reduces Cost of Energy for This Service—Future Development Assured

By C. H. HUNTLEY

The danger of glaring automobile headlights to motorists, to pedestrians and to the drivers of horse-drawn vehicles has long been apparent, and continued reports of accidents due to this cause show how great the menace is. How to overcome it has been one of the chief problems confronting those anxious to promote the safety of highway travel and reduce the number of casualties that figure so constantly in the news columns. A new lighting system for highways has been devised by the General Electric Co., Schenectady, N. Y., and tried out under exceptionally exacting conditions. It has proved to be a solution of the problem according to those who have observed its effects—and this number includes motorists, pedestrians, engineers and people living along the roadway where it has been installed.

The essential feature of the system is a nest of three parabolic reflectors, one inside another, with an opening in each reflector on each side of the mazda lamp employed. Thus, the greater part of the light that would otherwise be lost by reflection upward and outward to the neighboring fields is collected and cast both ways along the highway. The inner reflectors pick up the rays of light that would escape if only one reflector were used and direct them toward the surface of the road at an angle of 10 deg. below the horizontal, giving the same effect as an overhead reflector 15 ft. in diameter. Glare from the incandescent lamp is reduced by the white reflecting surfaces of the unit without the aid of diffusing globes. The bracket which holds the unit is adjustable either vertically or horizontally, so that the unit may be placed on poles near the roadway or some distance from it and may be turned to illuminate curves and hill sides. This range of adjustment makes it possible to keep

Night View of Road Illuminated With Lamps Mounted in Special Reflectors.

the opening in the lower part of the reflector parallel and in line with the surface of the roadway under any condition. The light may be thrown just where it is needed.

This system has been installed along a section of the Albany-Schenectady state highway for a distance of about 2 mi. eastward from the Schenectady city line. The lamps are bracketed on poles 30 ft. above the roadway at intervals of from 300 to 500 ft., one 250-cp., 159-watt lamp being used in each fixture. Travel over this road is very heavy. The highway is the main thoroughfare between Albany and Schenectady and is also a link of one of the great east and west routes of general tourist travel. Conditions are complicated by the fact that there is a large suburban population living along it, especially near the city lines, and the road is therefore much used by pedestrians. Casualties have been numerous among both motorists and pedestrians.

By the installation of this new system the glare of approaching headlights has been eliminated. The roadway is so thoroughly illuminated that motorists can drive in perfect safety with the lights of their cars turned off. Pedestrians and approaching vehicles are plainly visible for a long distance, and the dark spot between two passing cars is eliminated. Motorists who travel over this road and persons living along it are enthusiastic in their endorsement of the illumination. Two comments on it, made from different standpoints, are typical of the others. "The lights are a great improvement," says a physician who lives in the territory traversed by the lighted section. "Only those who live out here and have been without lights can appreciate them. Sunday night it was pouring, but all the people coming from church walked out on the road and felt that it was perfectly safe to do so. I was able to read on the front porch of my house by the light from the highway lamps. Inside the house, with all the lamps in the house out, the rooms are flooded with light very much as they would be when the moon is full—and it is only reflected light we get."

An eminent engineer viewing the installation from the standpoint of a motorist and a citizen desirous of remedying the dangerous travel conditions of the highway says of it: "I have examined the lighting installation which has been made upon a section of the state road between Schenectady and Albany and want to express my opinion of the great value of this improvement which by a simple, durable and inexpensive means removes all the great dangers and inconveniences of night travel on this road where fatal accidents have for years been of frequent occurrence, and where night travel has been a worry and a strain to all who have had to use it.

"This arrangement distributes the light generated by a small power consumption along the line of the road in such a manner that cars and people can be seen a mile ahead, so that it is as easy and safe to run without headlights as with them. Even the glare of headlights on approaching cars does not for a moment obscure the road or its borders. The addition of such lighting would increase the expense of construction and maintenance of a road by a very small percentage. The improvement afforded is certainly greatly in excess of such expenditure and this lighting should be put upon every important highway, particularly where it runs through populous districts as is frequently the case near cities. The facility of automobile travel on these roads causes residences to be distributed along them for many miles near and between cities. The state highways are generally not provided with sidewalks and are used by many pedestrians at all hours."

The town of Colonie near the eastern end of this installation is so pleased with the result of this system that it has contracted with the Adirondack Light & Power Co. for 30 of the units, and 100 units of this type have been ordered for a highway near Detroit. A similar system is in operation near Swampscott, Mass. Officials connected with the "Ideal Section" of the Lincoln Highway, which is to be built in Indiana, and which is to be made as nearly perfect a stretch of highway as can be constructed, have witnessed a demonstration of these lights and are contemplating installing them along the section mentioned. The engineer of the Bronxville Parkway Commission is interested in them, and they may be used for lighting the roads that traverse that beautiful park.

Various incidental benefits result from highway lighting. One is the lessening of the danger of holdups. Another is that it helps to solve the problem of supplying current for light and farm power to the rural sections. Central stations which may not see their way clear to construct transmission lines for such territory on account of the expense may find it entirely feasible to do so if the line can also be used to transmit energy for highway illumination. That highway illumination is destined to play a very important part in the "Good Roads" cause is apparent, and the day seems already at hand when lighting will be considered a regular item in highway construction and maintenance appropriations.

## OVER 130,000 OHIOANS NOW OWN UTILITIES SECURITIES.

More and more the public service companies of Ohio are becoming the property of their customers—the people they serve. Latest statistics compiled by the Ohio Committee on Public Utility Information show that more than 130,000 Ohioans now own securities of electric light and power, gas, telephone and electric railway companies. Considering families and dependents of these investors, this means that about one-tenth of the people of the state are financially interested in the concerns that furnish such vital necessities as light, heat, power, communication and transportation services. Ohioans who are owners of telephone securities number 49,000; electric light and power securities, 29,000; electric traction securities, 24,000, and water company securities, 1000.

The number of customer-owners has been increasing by leaps and bounds during the last few months. Many of the larger public utilities that serve the people of the state are waging active campaigns to increase the number of customers who own securities. In addition to direct ownership of utility securities, Ohioans are financially interested in the utilities in another way.

# EDITORIAL COMMENT

## *The Editor's Farewell*

In 1883, over the name of "Bi-Polar," my first contribution appeared in the **Electrical Review,** a journal founded by George Worthington in February, 1882. I continued as a correspondent for two years. In January, 1885, I became one of the editors and subsequently editor-in-chief of the **Electrical Review** and President of the Electrical Review Publishing Company. Therefore, I have been associated with the **Electrical Review,** ending tomorrow, thirty-nine years.

There have been many wonderful developments in that period. To mention them in even partial detail would too greatly extend this farewell word. The changes electricity has wrought are now, indeed, a large part of the world's history—fascinating and awe-inspiring history.

Since 1883, the telegraph, with its wireless signals and cable improvements and extensions, has made this entire globe of ours virtually a known and understood community. This has been a powerful, yet unseen, influence for the permanent peace of the world that now seems impressively at hand.

Telephone service of today covers North America, and California and Maine have become chatty next-door neighbors, and through wireless telephony, miraculous as it even yet seems, the human voice and our spoken words have been heard and understood half around this earth and are speeding on to the planets of the heavens as rapidly as sound can annihilate many million miles of space! The telephone amplifier has just now made dreams come true, and last month President Harding's address on Armistice Day at Washington was heard and easily understood by vast audiences in New York and San Francisco, assembled in halls and public parks. Just give this wonderful achievement one moment's thought! Only a decade ago no one would have dared predict it.

The X-ray, discovered by Roentgen in 1895, has been of the most valuable aid to surgery and to the medical profession in general. How absolutely impossible such an application of electricity seemed to all of us until it came!

And without the electric spark it is a safe prediction that there would have been no automobiles or flying machines, and without the electric storage battery the submarine would probably have never become an under-water moving machine, nor would explosive, fire-causing oil lamps and gas lamps have disappeared from railway trains.

The swift and tremendous advance in the use of electricity for lighting and the refinement and expansion that has characterized

this most important development, and the electric trolley that changed almost over-night the motive power of street and suburban traffic, constitute other gigantic electrical advances and triumphs.

What has not been accomplished by the flexible and power-giving electric current? Many hundreds of miles is it carried from waterfall source to economically supply light and power. Only a few days ago one of our most eminent scientists announced the practicability of an electric power transmission of one million volts.

And what home has not been brightened and labors lightened by the innumerable and skillful applications and adaptations of the electric current—to light, heat and power; to the electric range, fan, smoothing iron, sweeper, decoration. It is trite, indeed, to speak of these things now. But in the early eighties when the **Electrical Review** was first published, and its editors were hopefully trying to discern the future, how little was realized of the vast utilitarian scope of this new and ever progressive art.

The advent of electric transmission lines, entirely unknown in those early electrical days, changed methods of traffic in city street and country road the world over. This was in 1887-8. The steam roads, too, are slowly and surely turning to this still mysterious, imponderable electric current for power transmission. Our latest ships of war depend on electricity for their safest and speediest propulsion.

How electricity has changed our methods of living since 1883! Where has it not touched? The science has developed with uncanny rapidity and so startlingly that promising inventions have often become obsolete within a few weeks of their birth and have been discarded for still newer and more efficient ones.

Today, however, there has come a stabilized period—a time to collect one's thoughts, and to carry to safe and thorough completeness the inventions that are comprehended and self-sustainable.

The **Electrical Review** has ever sought to encourage the development of the electrical industry along most constructive lines. Its editors from the first believed in and urged fuller association, the meeting of individuals and the open discussion and solving of the problems that daily presented themselves, particularly in the early formative period. The **Electrical Review** originated several national associations and fostered and counseled many more of wide value and importance.

There are three, yes four, incidents in my extended editorship of the **Electrical Review** that come to me as I rush—the truth!—this article to the printers, and I will risk the tolerance of my forgiving readers by telling them.

The first was on the day in January, 1885, when I came with George Worthington, editor and chief owner of the **Electrical Review,** and was told by him that the call just issued by the **Review,** for the meeting of electric light men in Chicago the month following,

had met with the opposition of several manufacturers of lighting apparatus, all of whom were our patrons and friendly supporters. Fresh from several years' active editorship of the leading daily in a western state where political action and wisdom, plentiful there, had been absorbed with all the avidity of ambitious youth, I am pleased to this day that the courage and audacity thus early acquired prompted me to respond: "Let's go ahead with that convention. We are right, and soon your manufacturing friends will see it." And we went ahead—and they did see it, and the great power and influence of the National Electric Light Association has come to pass and is known to all. And it made my heart rejoice at that first convention in February, 1885, to have one of the strong men in attendance stand up and say that his illuminating company was a licensee of a well-known manufacturing company that had written him that it did not approve of this proposed convention and requested him to stay away. With a big fist in the air, and a voice that carried through the corridors of the Grand Pacific hotel, he emphatically announced—"That's why I am here!"

The next period was when the **Electrical Review** published in the early nineties a series of weekly articles under the nom de plume of "The Prophet" filled with most interesting and astounding predictions of the future developments to be expected in electric science. Subsequent events proved the accuracy of this gifted prophet's vision, who had so ably pierced the future. These contributions finally ceased, largely because there grew up a suspicion that the ideas and suggestions they contained were finding their way to the patent office from ingenious readers and inventors—"outside barbarians," as the Chinese would say. At the time and since the identity of "The Prophet" was sought and much commented on but until today was never disclosed, and but two persons ever knew—the author and myself. I will tell it, and am probably in for a scolding: John J. Carty of New York, the distinguished telephone engineer, honored at home and decorated abroad, was the wizard author, and his famous, world-known achievements of later days have contributed to no small extent in bringing to pass these prophecies thus early announced over a quarter of a century ago!

In 1895-6-7, following the Roentgen-ray discovery, the **Electrical Review** published a series of brilliant and timely articles by Nikola Tesla, describing this X-ray, telling the results of his (Tesla's) wonderful laboratory experiments. These exclusive contributions, which could only have been written by one who previously had been studying in that field, were most widely quoted and read with the keenest interest by scientists and laymen the world over. They gave a distinct and acknowledged prestige to the **Electrical Review** and brought added fame to the exploring author. Tesla, too, had in 1893 in a lecture before the National Electric Light Association at St. Louis, suggested and outlined wireless telegraphy; which Marconi afterwards brought to successful use, entirely independently as far as I know.

Then came the third instance that I recall most easily and vividly—the exclusive announcement in the **Electrical Review** of Prof. Michael I. Pupin's scientific distance-conquering invention that, speaking non-technically, set the ugly resistances to be met with in electric wire transmissions of the human voice to quarreling with themselves—kept them on the side, as it were—and the spoken words rushed through the wire path thus opened to their destination across the United States, and made possible vocal transmission beneath the oceans from continent to continent. I will tell the story of how this was obtained:

A Friend (at luncheon): "Price, Pupin has sold his 'choke-coil' invention to the American Telephone & Telegraph Company. Had you heard it?"

Price (Dissembling his ignorance): "Glad to hear it. His work deserved big recognition. How much did he get?"

A F.: "Oh, half a million and a retainer of $15,000 a year to guarantee first offer of his future inventions for a period of years."

P.: "I shall congratulate him and the company later." (How much later, I didn't say!) "What all will Pupin's invention do?"

A F.: "It makes possible telephoning across this continent and, if it would pay, beneath the ocean to Europe."

P.: "That's what I thought" (may the Recording Angel overlook this!). "When is this revolutionary invention to be announced?"

A F.: "Oh, soon. You should see Vail or Carty. They'll tell you all about it."

This was the one time that I carefully avoided seeing either one of my good friends as suggested. I knew the stipulations of secrecy that would follow, and which I would feel compelled to honor if the news was confirmed by them. Instead, and in my own way—learned as a reporter on daily newspapers—I substantiated the statement of "A Friend" and published the story exclusively and conspicuously in the fine issue of the **Electrical Review** on the first of the month in January, 1900—the beginning of the twentieth century. My esteemed friends of the Associated Press sent the news out with proper credit and the world sat up and took surprised and pleased notice.

Then, and fourthly in my reminiscences, comes an incident that to me was of unique and gratifying value. My technical editor was Charles Tripler Child, one of the most capable and vividly clear writers on electrical subjects I ever knew. Suddenly Marconi announced that he had by means of wireless telegraphy signalled from Poldhu on the coast of Wales across the Atlantic to the Canadian coast. The world was aghast (this was many years ago and we hadn't become accustomed as yet to these startling achievements) and doubtful. The **Electrical Review** appeared the next day with a convincing, brief editorial, penned by Child (who had been following Marconi's work closely), stating that we believed Marconi's statement to be true—not the delusion of a sanguine inventor—one that his experiments and studies in the recent past, in addition to our personal faith in him, proved to us that successful air transmission as announced could have been made. This editorial paragraph, backed by the authority of the **Electrical Review** that dared to say it, established William Marconi's credit with the technical

fraternity, especially where he was personally unknown, and throughout civilization. I often wonder if Marconi knew it! I never asked him.

One concluding incident: Child and I visited Edison at his laboratory a few days before his most original invention of the Edison storage battery was to be announced by Dr. A. E. Kennelly at the meeting of the American Institute of Electrical Engineers. We thus got in advance all the details of the invention (to the intense admiration and excitement of Child, I recall) so the story could be put in type and appear in the **Electrical Review** which came out the next morning after the Institute meeting. Some cautious associates of the great inventor, present in the laboratory, questioned the advisability of our taking the story with us in this way. Edison's reply I cherish to this day: "I'll trust Price." His trust, needless to say I hope, was not betrayed.

But this farewell word of mine is becoming too long.

May I be pardoned for a personal note? It seems to me that so many of the strong, earnest men of the industry that it was my privilege to know in 1885, are still in active, absorbing electrical life, that to call the roll in part will be proper now. A few of those I became acquainted with that year (my first as a stripling editor of **Electrical Review**) and whom it is an extreme pleasure to meet and greet today, nearly all in health and vigor, are named below. Remember this was in 1885:

DR. E. G. ACHESON
DR. GEORGE H. BENJAMIN
CHARLES F. BRUSH
C. A. BROWN
COL. H. M. BYLLESBY
COL. JOHN J. CARTY
C. A. COFFIN
EDWARD A. COLBY
LEONARD E. CURTIS
A. J. DeCAMP
R. W. DEVONSHIRE
LOREN N. DOWNS
CHARLES E. DUSTIN
THOMAS A. EDISON
JAMES ENGLISH
C. N. FAY
BRADLEY A. FISKE
HENRY HINE
SAMUEL INSULL
J. N. KELLER
THOS. D. LOCKWOOD
GEORGE T. MANSON
T. COMMERFORD MARTIN
JAMES H. McGRAW
A. H. PATTERSON
RALPH W. POPE
E. W. RICE, JR.
A. L. SALT
ELMER A. SPERRY
FRANK J. SPRAGUE
B. E. SUNNY
CHARLES A. TERRY
F. S. TERRY
H. B. THAYER
ELIHU THOMSON
GEORGE G. WARD
DR. EDWARD WESTON
DR. S. S. WHEELER

What an array of men of 1885 who have made their mark in various branches of electrical development and who are still with us, after thirty-seven years of active endeavor. Does working with electricity bring one the waters that Ponce de Leon sought on this continent—the Fountain of Youth? [1]

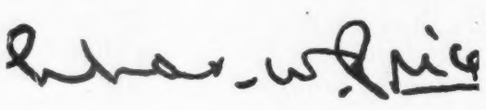
[1] In the evening of the day I wrote the above I read where my old-time friend A. Edward Newton of Philadelphia, in his entertaining book "A Magnificent Farce and Other Diversions of a Book-Collector," had said "If an electrical business will not prematurely age a man, nothing will." And yet he is young enough and capable enough, after a life of successful electrical work, to write brilliantly and wittily and picturesquely in his own books, delighting every reader. No, A. Edward, your electrical business did not "age" you; rather it developed your intellectuals—the friction, the intensity of it—and sent you forth to achieve another success in a different world—the world of letters.—C. W. P.

I would like to give the names of friends who have passed away, men of force and attainment who ably assisted in electrical development in different phases. Such men as Theo. N. Vail, Geo. Westinghouse, Elisha Gray, William Stanley, George Worthington, W. L. Candee, Enos M. Barton, Thomas B. Doolittle, Cyrus O. Baker, Franklin Leonard Pope, E. T. Gilliland, Dr. W. M. Habirshaw, Charles J. Van Depoele, Dr. Louis Duncan, Peter Cooper-Hewitt, F. B. Crocker, Eugene Phillips, M. M. Slattery, Henry Rowland, William H. McKinlock, Henry C. Davis, but space will not permit. What a flood of fine memories comes to one who knew and understood the earnestness of these men and the importance of their achievements.

Today I bid a journalistic good-bye to my friends of the **Electrical Review.** One of the greatest satisfactions to me is the fact that this journal under its new management will continue to assist and counsel the best efforts in the science and industry it has throughout its life endeavored to represent and promote.

The eminent and enterprising publisher who heads the company which now includes the **Electrical Review** as its thirteenth journal, has stood for clean, self-respecting technical and administrative policies. In this respect James H. McGraw and I have stood together, facing the same way, and while there has been at times stimulating competition, it has always been honorable competition and we were ever able to meet on the common ground of doing that which we believed to be best for the proper development of the electrical industry as a whole, and often when personal gain might have suggested a different attitude.

As a modest student of such things, it is my conviction that there never was, and probably never will be, an industry so ably and encouragingly and comprehensively represented by its publications as the one from which after a close relationship of thirty-nine years the author of these lines takes his journalistic leave. And as tomorrow I depart, still with youthful ardor, to where agreeable associations and growing publishing interests (with which I have been identified as Chairman of the International Trade Press, Inc., for the past five years) which seem to require my entire time, I wish to extend to all whom it has been my privilege to know in electrical pursuits a sincere and heartfelt regard and the cordial wish that health and happiness and success abide with them every one. Goodbye!



Editor Electrical Review.

## INCORPORATE MILWAUKEE "BETTER LIGHTING CAMPAIGN."

**Committee Proposes to Extend Its Activities for Betterment of Lighting Conditions Throughout Wisconsin.**

The Milwaukee Better Lighting Campaign Committee which was formed by prominent members of the local electrical interests to stimulate the interest of the general public in better lighting, has proven so successful and the work is becoming so extended that the committee has now established permanent headquarters at 1324 First Wisconsin National Bank building, Milwaukee, and is incorporating under the title of the Electrical Development Association of Wisconsin. It is proposed to extend its activities for the betterment of lighting conditions throughout the state.

A diagram has been prepared showing the plan of the Better Lighting Campaign which is now in full swing in the Milwaukee district and which is being actively supported by the Milwaukee Chandelier Club, the local branch of the National Council Lighting Fixture Manufacturers, the association which originated the Better Lighting Campaign idea and which is co-operating with the local interests to assure its success.

The campaign is timed to reach its zenith during the week of January 30-February 4, 1922, when the great Lighting Fixture Market and Joint Convention is to be held at the Milwaukee Auditorium under the direction of the National Council, assisted by the Lighting Fixture Dealers Society of America and the Illuminating Glassware Guild.

LIST OF EXHIBITORS AT MILWAUKEE FIXTURE MARKET.

The Lightolier Co., New York City.
Gillinder & Sons, Inc., Philadelphia.
Lyons & Jourdon, New York City.
Biltmore Lighting Fixture Co., New York City.
Bryant Electric Co., Chicago.
Lincoln Manufacturing Co., Detroit.
National X-Ray Reflector Co., Chicago.
Dallas Brass & Copper Co., Chicago.
Electric Outlet Co., New York City.
Edw. N. Riddle Co., Toledo, O.
Mitchell Vance Co., New York City.
Benjamin Electric Manufacturing Co., Chicago.
R. Williamson & Co., Chicago.
F. Wakefield Brass Co., Vermillion, O.
A. Vester Sons & Co., Providence, R. I.
National Metal Spinning & Stamping Co., New York City.
Voss & Co., New York City.
Electrical Testing Laboratories, New York City.
Radiant Lighting Fixture Co., New York City.
Mutual Lamp Manufacturing Co., New York City.
Beardslee Chandelier Manufacturing Co., Chicago.
Acme Lighting Fixture Co., New York City.
Moran & Hastings Co., Chicago.
Crown Electrical Manufacturing Co., St. Charles, Ill.
Phoenix Light Co., Milwaukee.
Classique Lamp Studios, Milwaukee.
Phoenix Glass Co., New York City.
Pass & Seymour Co., Inc., Solvay Station, Syracuse N. Y.
Mazzolina Art Craft Co., Cleveland.
Scott-Ullman Co., Cleveland.
Morreau Co., Cleveland.
The Kayline Co., Cleveland.
Highlands Manufacturing Co., Muncie, Ind.
Gillinder Bros., Port Jervis, N. Y.
Lighting Products Co., Milwaukee.
Friedley & Voshardt Co., Chicago.
St. Charles Fixture Manufacturing Co., St. Charles, Ill.
Grassler & Gezelschap, Milwaukee.
Jefferson Glass Co., Follansbee, W. Va.
Brandt-Dent Co., Watertown, Wis.
The Voigt Co., Philadelphia.
Novelty Lamp & Shade Co., Cleveland.
Perfectlite Co., Cleveland.
Frankel Light Co., Cleveland.
Arthur Harrison & Co., Chicago.
G. C. Everson & Co., Chicago.
Edwards Lighting Fixture Co., Chicago.
H. A. Framburg & Co., Chicago.
Cassidy Co., New York City.
Faries Manufacturing Co., Decatur, Ill.
Chas. Polacheck & Bro. Co., Milwaukee.
H. Northwood & Co., Wheeling, W. Va.
Moe-Bridges Co., Milwaukee.
*Lighting Fixtures & Lighting*, New York City.
R. Milt. Retherford, Muncie, Ind.
Chas. Daiger Co., Boston.
McPhilben Lighting Fixture Co., Jamaica, N. Y.
L. Plaut & Co., New York City.
Peerless Light Co., Chicago.
H. D'Olier, Standardization Service, Bridgeport, Conn.
Jeanette Shade & Novelty Co., Jeanette, Pa.
Egyptian Lacquer Manufacturing Co., New York City.
Waukegan Chemical Co., Waukegan, Ill.
Gage Publishing Co., New York City.
Champion Brass Works, Coldwater, Mich.
Shapiro & Aronson, Inc., New York City.
Max Schaffer Co., New York City.
Gaites-Peace Co., Brooklyn, N. Y.
Eagle Glass Co., Wellsburg, W. Va.
*Electrical Merchandising*, New York City.
Macbeth Evans Glass Co., Bridgeport, Conn.
Robt. Findlay Manufacturing Co., New York City.
Hocking Glass Co., Lancaster, Pa.
Biddle-Gaumer Co., Philadelphia.
Thomas Day Co., San Francisco.
J. H. White Manufacturing Co., Brooklyn, N. Y.
P. W. Sprecher Manufacturing Co., Milwaukee.
E. N. Riddle Co., Toledo, O.
Ivanhoe Regent Works of General Electric Co., Cleveland.
Gleason-Tiebout Glass Co., Brooklyn, N. Y.
Hudson Brass Works, Brooklyn, N. Y.
Horn & Brannen Manufacturing Co., Philadelphia.
Decorative Lamp & Shade Co., Philadelphia.
Incandescent Supply Co., New York City.
Daison Manufacturing Co., Philadelphia.
Holophane Glass Co., New York City.
Star Chandelier Co., New York City.
Consolidated Lamp & Glass Co., Corapolis, Pa.
H. R. Sulzer & Co., Philadelphia.
Bridgeton Chandelier Co., Bridgeton, N. J.
Wm. R. Noe & Sons, New York City.
Corning Glass Works, Corning, N. Y.
Aladdin Manufacturing Co., Muncie, Ind.
C. J. Nikolas & Co., Chicago.
Oscar J. Friedlaender, Inc., New York City.
St. Louis Brass Manufacturing Co., St. Louis.
Max Schaffer Co., New York City.
Gill Glass Co., Philadelphia.

## WESTERN STATES EMPLOYES HOLD FIRST BANQUET.

About 100 employes of the Western States Gas & Electric Co. attended the first banquet of employes held recently at the Lincoln hotel, Stockton, Cal. This is the first affair of the kind sponsored by employes of the company and proved a great success. H. R. Bennett, purchasing agent of the company, acted as toastmaster.

A department of domestic economy where electric cookery will be demonstrated and explained, has been installed by the Dayton (O.) Power & Light Co. The duties of those in charge of the department will be to advise users of electric ranges and small electric cooking devices as to the proper use of the equipment so they will get the best results at the lowest possible cost.

# PERSONAL MENTION

***Biographical Sketches and Chronicle of Changes in Business Connections, Promotions and Other Personal News of the Industry***

HERMAN W. BOCHER resigned as instructor of electrical engineering in the School of Engineering, Milwaukee, to become power dispatcher with the Illinois Traction System, Peoria, Ill.

GEO. LEE HOADLEY is now head of the department of electricity in the School of Engineering, Milwaukee. Until this fall he was teaching in Washington State College at Pullman, Wash.

CHAS. H. MATTHEWS is with the Smith Green Co. of Worcester, Mass., as sales engineer. He was until recently an electrical engineer with the Westinghouse Electric & Manufacturing Co.

WM. HOWARD GROVE, formerly with the Republic Railway & Light Co., New York City, has entered the electrical engineering department of the Cleveland Electric Illuminating Co. of Cleveland.

CARL H. DUNLAP has become head of the electrical engineering department of the American School of Correspondence, Chicago, having left his position as chief inspector with Roth Brothers & Co., of Chicago.

J. F. KELLEY, JR., has been made export sales manager for the Electric Storage Battery Co., Philadelphia, with headquarters at 23 West 42d street, New York City. He has been with the company since 1909, lately returning from a 2-yrs. trip in foreign countries.

H. C. SOULE, who for some time past has been manager of the apparatus department of the Westinghouse Electric International Co., with headquarters at East Pittsburgh, Pa., sailed from New

**H. C. Soule.**

York City last month for Buenos Aires, Argentina, where he will take up duties in the office of L. T. Peck, managing director of the Cia. Westinghouse Electric International, S. A., of Argentina. Mr. Soule has been associated with the Westinghouse company since 1903. After graduating as an electrical engineer from Syracuse University he entered the apprentice course at East Pittsburgh. He finished his apprenticeship in 1905 and was detailed as design engineer on power transformers. In 1907 he was reassigned as section engineer on airblast and railway transformers. After having been on this work for 3 yrs. he was made section engineer in charge of design of OIWC-OISCT-AB and ring transformers. As a consequence of this work in 1913 he was appointed general engineer on transformers and central station work. In March, 1919, he transferred to the Westinghouse Electric International Co., taking charge of the negotiation section and after a year on this work was made manager of the apparatus section. Mr. Soule is an associate member of the American Institute of Electrical Engineers and belongs to the Psi Upsilon fraternity.

ERNEST R. FELLOWS, formerly with the General Electric Co. as inspector of hull material for the U. S. Navy, has left Schenectady to become superintendent of construction for the Associated Telephone Co., Long Beach, Cal.

EMERSON A. ARMSTRONG is now located with the Public Service Co. of Northern Illinois, in charge of power sales for the Joliet district. Mr. Armstrong some months ago left the Lincoln Motor Co. of Detroit, where he was assistant superintendent of construction and maintenance, and has since been engaged in special design and lecture work at the Michigan State College.

BERNARD E. SUNNY of Chicago, president of the Illinois Bell Telephone Co., and the Wisconsin Telephone Co., was elected president of the Old Time Telegraphers' and Historical Association at its recent reunion held in Richmond, Va. Mr. Sunny is one of the most prominent figures in electrical circles in the country and at one time was western manager and vice-president of the General Electric Co., which position he held for 20 yrs.

WILLIAM A. DURGIN, secretary of the budget and expense committee and secretary of the advisory committee of the Commonwealth Edison Co., Chicago, on Dec. 1 became associated with the Department of Commerce in Washington, D. C., under Secretary Hoover. Mr. Durgin will help the Government launch and accomplish its program of eliminating waste in industry by simplification. He will head a new division of a bureau in Washington whose task will be to co-ordinate the Government's efforts to place American industries upon a simplified, economical basis and at the same time give a sense of direction to the many programs of simplification now being carried on by the industries themselves. He will act as the contact man between the Government and industry. Mr. Durgin is well known and highly esteemed in the electrical fraternity. He was born in Rochester, N. Y., June 19, 1880. He has been in the service of the Chicago Edi-

**William A. Durgin.**

son Co. and its successor, the Commonwealth Edison Co., since 1904. Mr. Durgin has written much on technical subjects, including a book entitled "Electricity, Its History and Development," published in 1912. He was active in war work as a public speaker, and he has also lectured on technical subjects, particularly electric lighting.

H. O. GARMAN, chief engineer for the Indiana Public Service Commission, has resigned, effective Dec. 31. Mr. Garman became consulting engineer for the Indiana Railroad Commission when that department was created in 1907. Later, when the Indiana Railroad Commission became the Indiana Public Service Commission, he was retained as head of the engineering staff. He has served 14 yrs. and under five different governors. He may be succeeded, temporarily at least, by Earl J. Carter, assistant to the chief engineer. He expects to give his entire time after Jan. 1 to private interests.

D. K. CHADBOURNE has been appointed manager of the New York office of the Westinghouse Electric International Co. He came to the Westinghouse company through the George Cutter Co. before it was affiliated with the Westinghouse organization as he was successively western district manager and eastern district manager of the latter company from 1912 to 1920, when he joined the Westinghouse Electric International Co. Before becoming connected with the Cutter interests, Mr. Chadborne spent 6 yrs. with the Allis-Chalmers Manufacturing Co. Mr. Chadbourne was graduated from Purdue University in 1906.

6.

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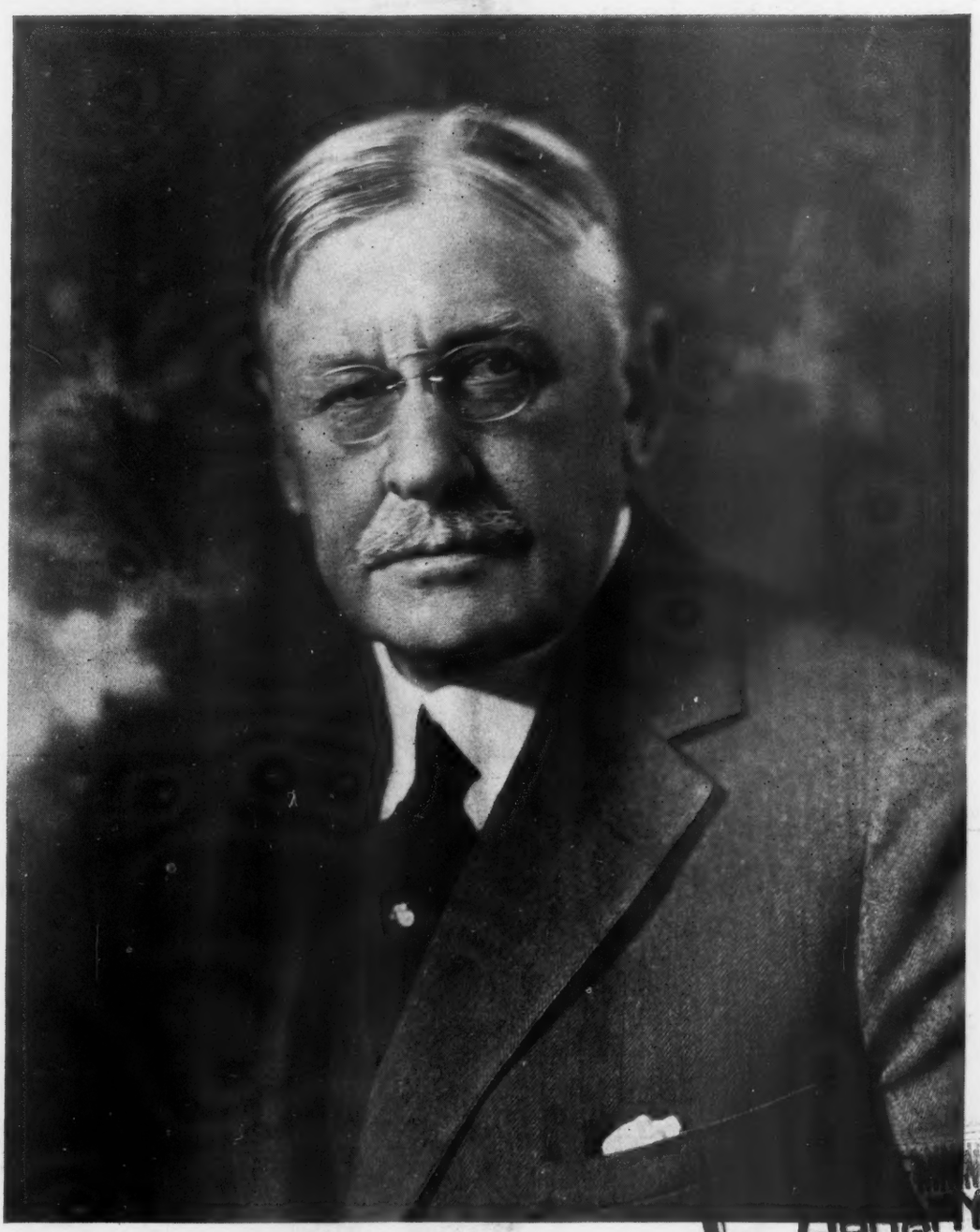
# Electrical Review

Vol. 79. No. 27. CHICAGO, DECEMBER 31, 1921. Three Dollars a Year.



CHARLES W. PRICE

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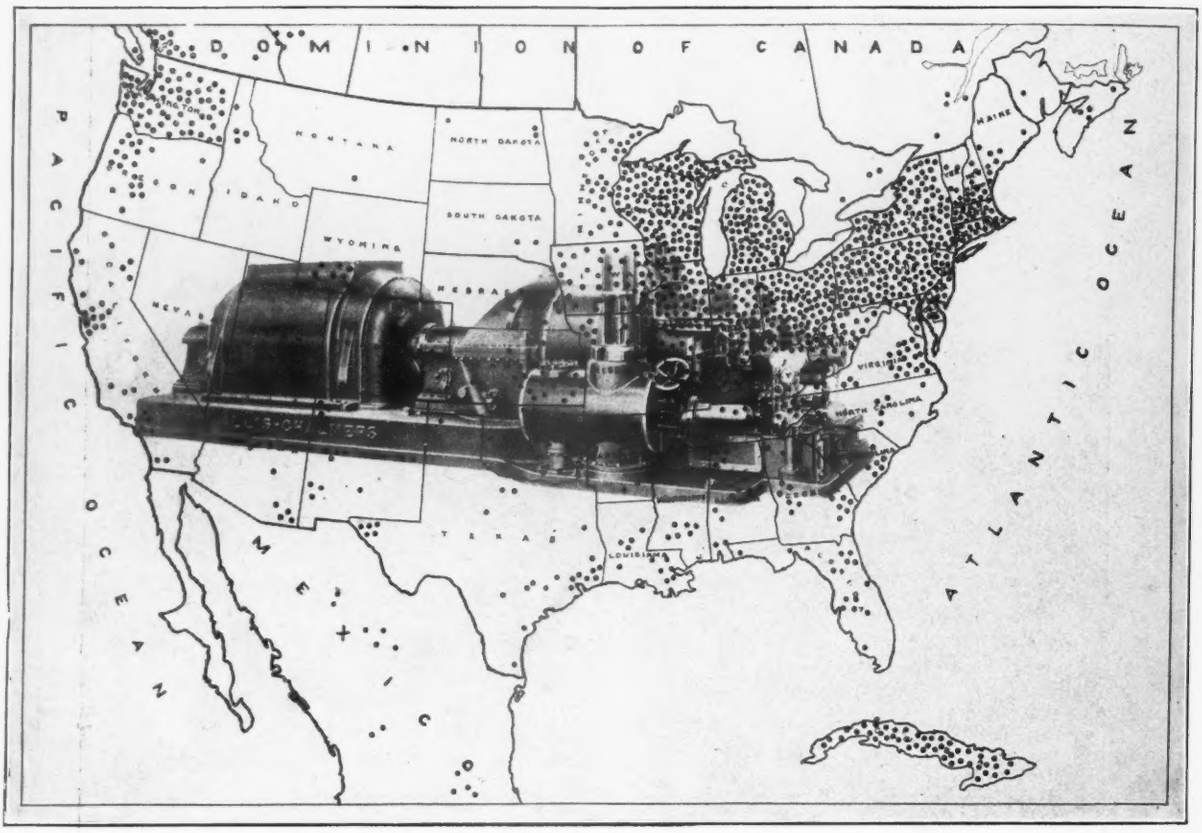
Mr. Price was a pioneer in the building up and co-ordinating of effort of the various factors of the Electrical industry. And if the result of his years of service is to be realized by the industry at large, each factor must be prepared to carry on in its own way with the same spirit that this great leader has inspired.

We take occasion at this time when Mr. Price is turning over the direction for the continuance of this effort to the McGraw-Hill Company to announce on page 3 what we are prepared to do as our contribution to the cause.

Rix J Cole

General Manager
Duplex Lighting Works
Of General Electric Company

# Allis-Chalmers Steam Turbine and Alternator Units




**Each Dot represents an Allis-Chalmers Steam Turbine installation and a satisfied customer.**

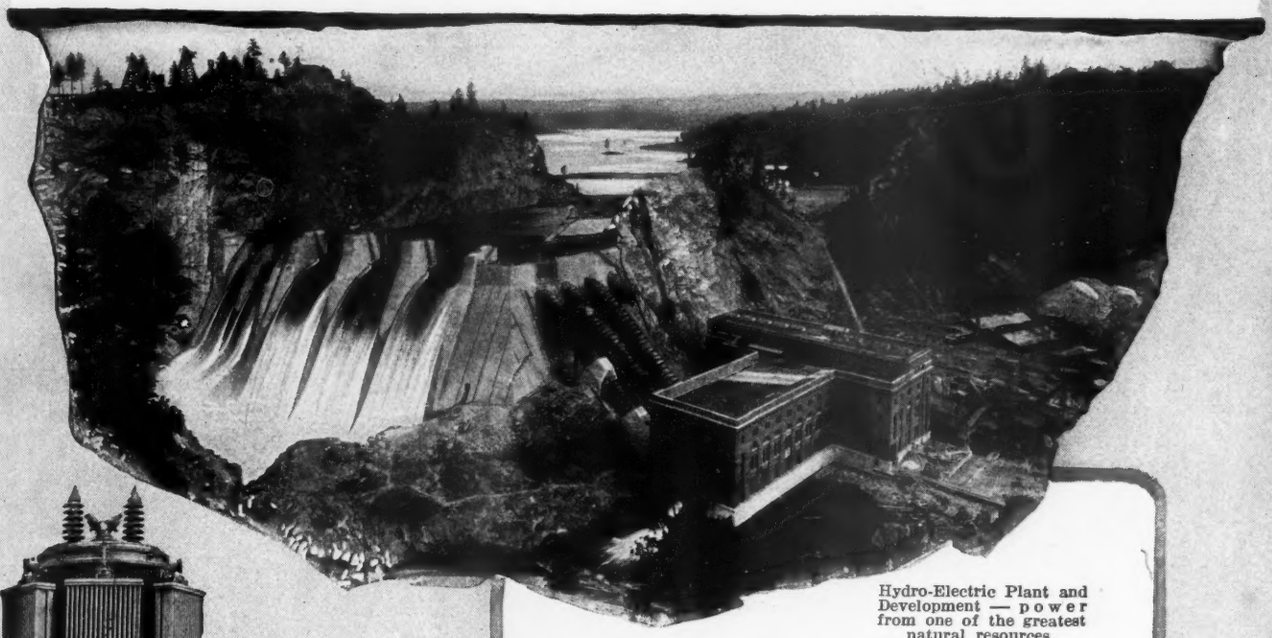
**Satisfied customers are possible only through EFFICIENT AND UNINTERRUPTED SERVICE**

**ALLIS-CHALMERS Steam Turbines are highly efficient, rugged in construction, built for continuous service.**

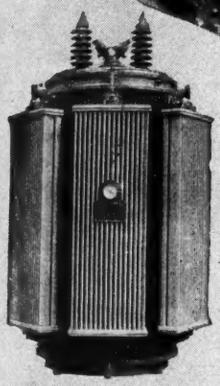
# ALLIS-CHALMERS

MILWAUKEE, WIS. U. S. A.

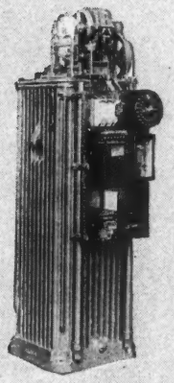
*The industrial use of electrical energy derived from available water power will pay big dividends on dollars invested in this development*



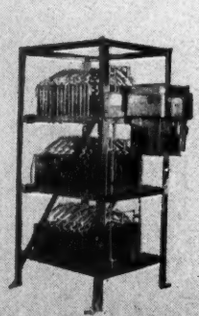
Hydro-Electric Plant and Development — power from one of the greatest natural resources.



Oil-Cooled Transformer—one reason for the big increase in distance of carrying electricity.



Induction Type Voltage Regulator—means electric power as you want it.



Three Phase Static Condenser Equipment—for power factor correction.

## Electricity—the power of progress

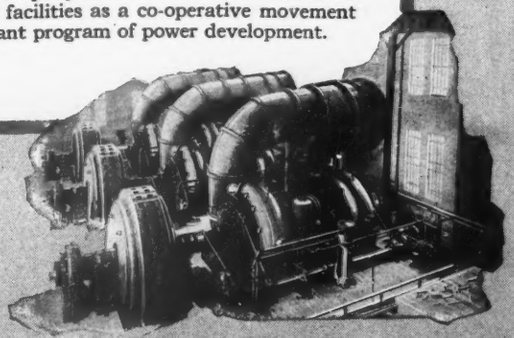
Accessibility of power to industry is no longer expressed in terms of "setting the mill beside the stream." Modern industry largely depends upon bringing the power of the stream to the mill, the site of which may be hundreds of miles from the source of water power supply—and electricity does it.

Electricity also brings the enormous resources of the country's coal mines to the public for general utility, for electrical energy amounting to billions of horsepower hours per year is efficiently and economically developed in the steam power plants of the nation.

Co-ordinated research, engineering, manufacturing and commercial efforts have made such a possibility an achievement of quick and ample power delivery at a cost which permits rapid development of industry.

The General Electric Company offers its enormous manufacturing and engineering facilities as a co-operative movement to advance this important program of power development.

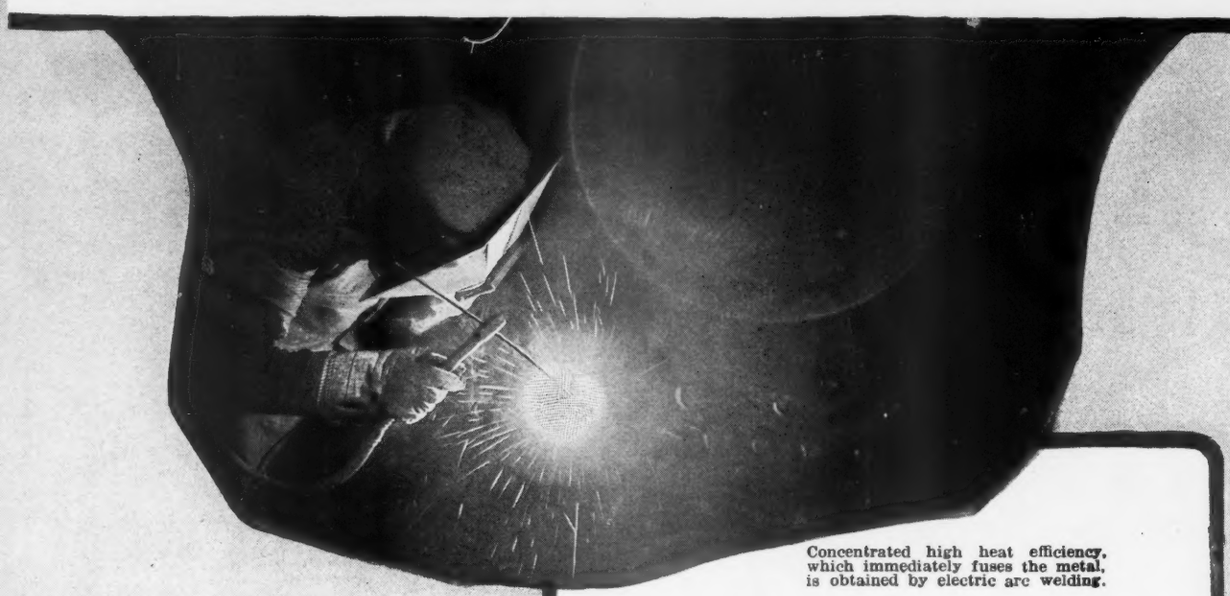
43B-500



Three Water Wheel Generator Sets in Modern Power Plant.

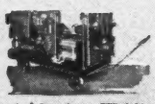
General Electric Company

*Progressive industry quickly gives preference to the process which can show its advantages over other methods—the modern way is to do it electrically*

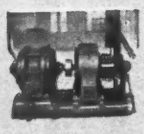


Concentrated high heat efficiency, which immediately fuses the metal, is obtained by electric arc welding.

Tilting Type Electric Brass Melting Furnace—2250 lbs. per hour



Portable Arc Welding Set permits of maximum use



Stationary Arc Welding Set is easily installed for operation.

Self-Regulating Bench Type Electric Melting Pot for metals—Bulletin 69703

Electric Rivet heater is essential to quick work well done—Bulletin 69701

Electric Soldering Iron — Production Helps in Booklet B-3514

## Utilize electric heat to the utmost

Electric industrial heating equipment is increasing production wherever it is applied. One of the most essential of electric heating methods is *electric arc welding.*

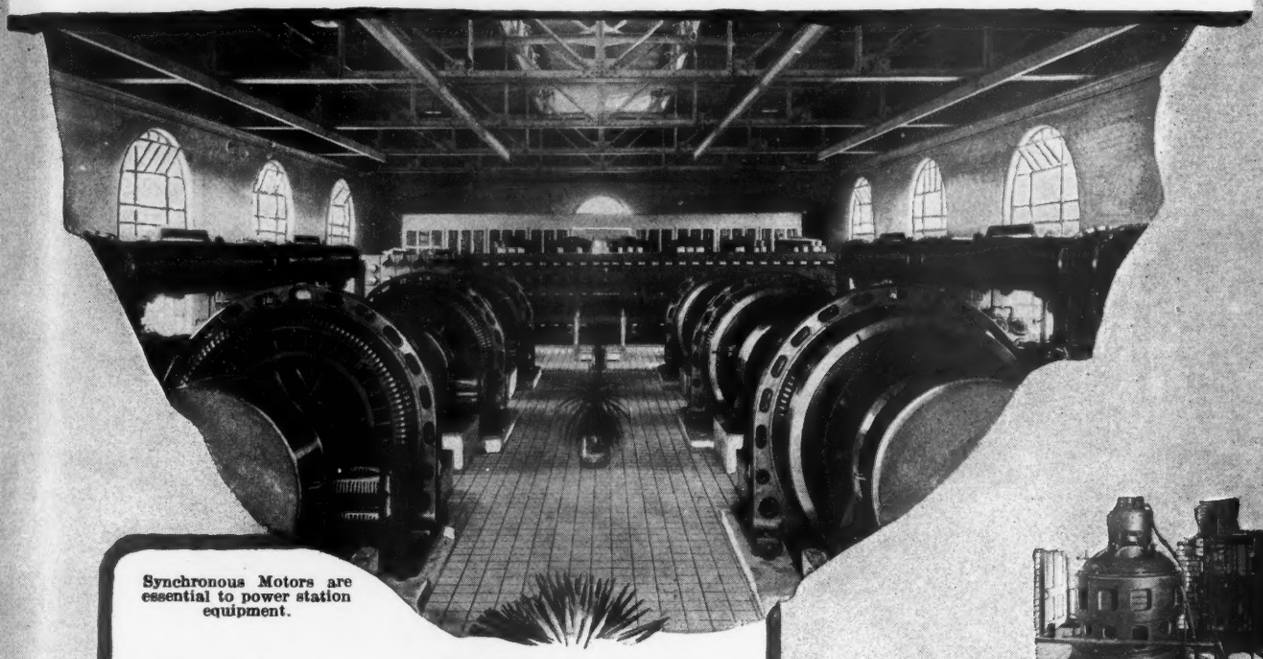
Electric arc welding maintains advantages in quantity, quality, and cost—wherever iron or steel is to be joined in repair work, salvage, or original manufacture. The utilization of its possible applications extends over steel and iron works—boiler shops—foundries—repair shops—machine shops—and innumerable other industries.

An unusual simplicity and elasticity of operation has been perfected in the designs of Stationary and Portable Arc Welding Sets manufactured by the General Electric Company. This equipment can be provided for either group or single operator service, and generator can be driven by any source of power—engine, belt, d-c. or a-c. motor. Send for Bulletin 48932-A.

General Electric Company

General Office
Schenectady, N.Y.

*Many users of electric power keep pace with industrial advancement by judicious application of motors which "keep step" with the current generator*



Synchronous Motors are essential to power station equipment.

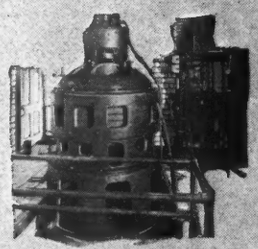
## Synchronous Motors—why used and where

Realization of the benefits of synchronous motor drive to practically all classes of industry today has been established by the unexcelled performance of this equipment in thousands of applications.

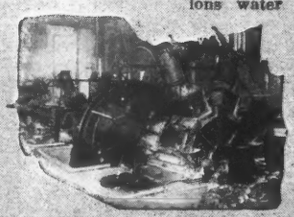
The continued maximum efficiency and durable operation of the synchronous motor have demonstrated their dollar-earning and dollar-saving qualifications in Steel Plants—Automobile Factories—Railroad Shops—Paper, Rubber, Flour, Cement and other Mills—where greater and more uniform production has been obtained at lower maintenance cost.

In addition to carrying a load, the synchronous motor is an efficiency guide to the power factor of the distribution system—bolstering up the laggard that eats into profits, cuts down output, and overworks machinery.

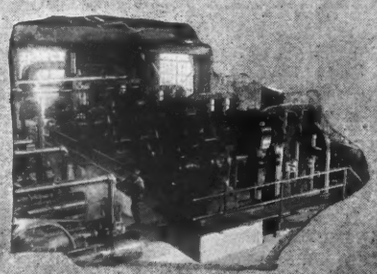
The recognized merits of the synchronous motor tell *why* you should use it. Ask specialists of the General Electric Company *where* its application fits your particular needs. Bulletin No. 41310 gives detailed uses of synchronous motors, and will be sent on request.



Vertical Synchronous Motor on deep well pump at packing plant—2000 gallons water per minute.



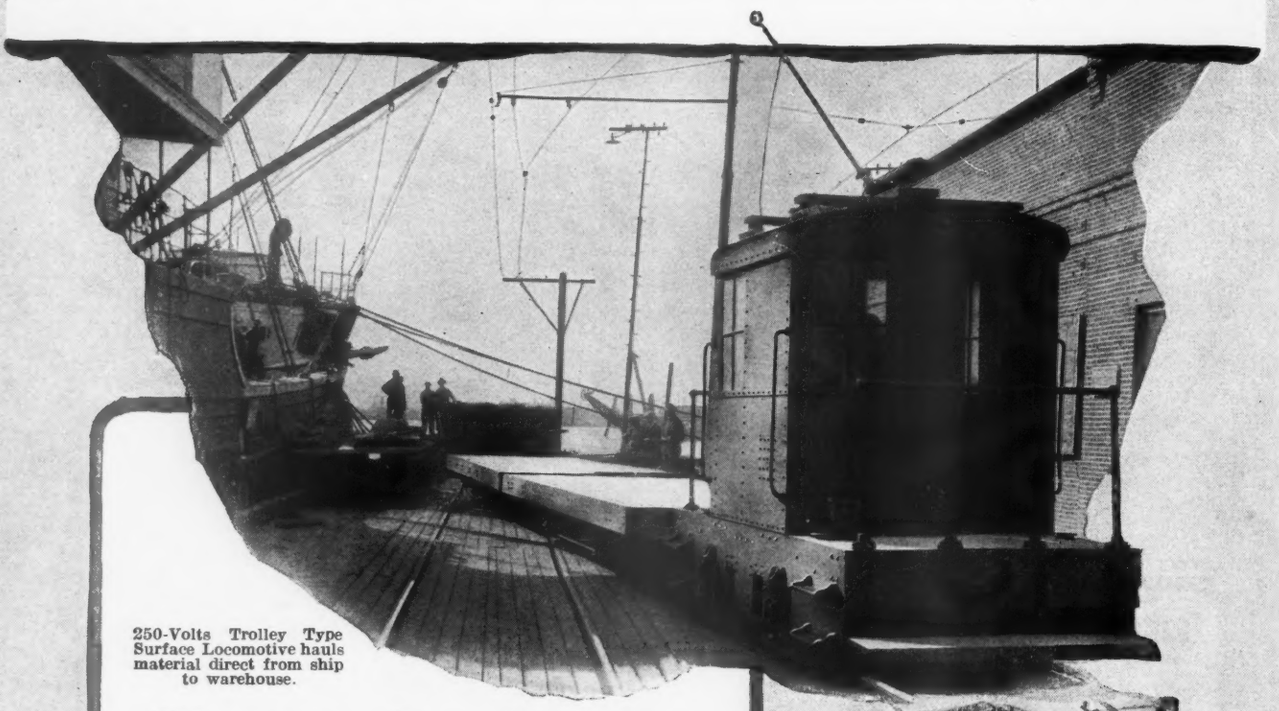
Synchronous Motor direct connected to two 4-pocket grinders in paper mill.



Synchronous Motors with Direct-Connected Exciters driving triplex pumps at concentration mill of copper company.

General Electric Company

*The rush of daily trade makes quick and systematic handling of materials imperative at ports, freight depots and industrial plants*



250-Volts Trolley Type Surface Locomotive hauls material direct from ship to warehouse.

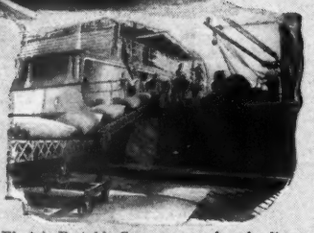
## Electricity does this most economically

The numerous applications of electricity to operating locomotives, conveyors, winches, stacking machines, cranes, hoists, tractors, and other mechanical devices—all have the same quick clearance effect on heavy traffic of the world's supplies at terminals.

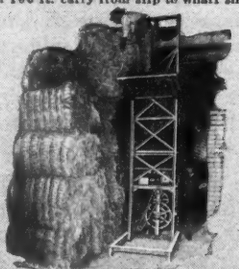
Barrels, boxes, crates, bales, rolls—by the ton—all moving about in every direction. No collisions, no accidents, no damage of goods—for electricity keeps everything moving quickly and orderly.

The savings range all the way from a seventeen day reduction in the round trip time of an ocean liner, to the marked economy of electrically piling from thirty to fifty feet high—a thousand pounds of material per minute.

Your individual needs of material handling equipment can best be filled by the manufacturers, who in solving your problems, obtain the specialized electrical experience and products of the General Electric Company.

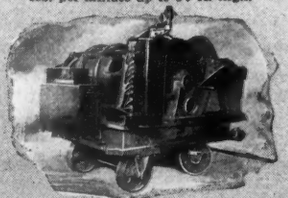


Electric Portable Conveyor speeds unloading with 100 ft. carry from slip to wharf shed.



Electric Portable Stacker piles 1000 lbs. per minute up to 50 ft. high.

Tractor and Trailers make quick headway in moving materials.



Portable Dock Winch—electric motor-driven—quickly puts power where you want it.

General Electric Company

General Office Schenectady, N.Y.

Sales Offices in all large cities

*Continued from Front Cover*

# In This Spirit of Co-operation

LAST spring we made a special offer of a Duplexalite and shade complete at a nominal charge for the homes of members of the electrical industry, and by means of direct correspondence, several thousand units were placed in the homes of those in the industry. Our experience has more than justified our spirit of co-operation. The direct results have been very gratifying and we are receiving an increasing number of inquiries from others in the industry for an extension of this educational offer.

Believing that we could do no greater service for the general good of the industry than to acquiesce to this demand, we have decided to reopen this offer and, to make its application more general, are making this announcement in the leading papers of the industry.

We are preparing to supply the demand promptly so that those in the industry whose activities are closely related to the merchandising of light, may have the opportunity of a personal demonstration and test of this wonderful development at the earliest possible time. This also in view of the intense nation-wide activities about to be inaugurated to awaken the people of this country to the health-ruining condition of the average home lighting and to the possible comfort and happiness to be realized from the use of modern electric lighting equipment now available.

To those who were not fortunate in availing themselves of the opportunity last Spring, this opportunity is now reopened. We extend the offer to every individual engaged in the electrical industry. For managers desirous of using this means of educating and stimulating the interest of their employees in better lighting, we will be glad to mail suitable certificates which, when properly filled out, will be accepted as shipping instructions.

DUPLEX LIGHTING WORKS
Of General Electric Co.
6 West 48th Street, New York City

**Duplex-a-lite**
*"The light to live with"*

Duplex Lighting Works
of General Electric Company,
6 West 48th Street, New York

Send me a supply of special offer certificates.
We have ____ employees.

*Name*_____ *Dept.*_____

*Company*_____

*Address*_____

# HAIL AND FAREWELL!

## *To Charles W. Price—*

Thirty-nine years!

That's a long, long time for a friendly relationship to endure.

And we say "friendly" advisedly for although the element of business has naturally entered into that relationship, we can't help but feel that both of us have grown up together, and surely we've been good friends.

Back in 1882, Electrical Review and the Western Electric Company were both pretty young.

Things were different in those days. We had a place in New York back of Trinity Church on what was then known as New Church Street.

Harry B. Thayer, now the president of the American Telephone and Telegraph Company, was manager, and Albert L. Salt, at present a vice-president of the Western Electric Company, was office boy, shipping clerk, sales manager and general factotum. Of that company of about one hundred pioneers these two, like you are still "on the job."

Then it was that you and George Worthington presented the case for Electrical Review so well that Mr. Thayer handed over our first contract for space in your paper.

We've been with you ever since.

We are grateful for everything you have done in those thirty-nine years to further our interests and we're sorry, that the electrical industry is losing your services, long and distinguished as they have been.

May you live long and prosper.

***Western Electric Company***

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CHARLES W. PRICE, *Editor.*

# Electrical Review

*The Oldest Electrical Weekly in America*

Entered as second-class matter Nov. 7, 1908, at the P. O. at Chicago, Ill., under act of Congress of March 3, 1879.

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APPROVED BY UNDERWRITERS' LABORATORIES

## A New Plug Fuse of Unequalled Performance—

**CLEARSITE Plug Fuses** have the following features of design and construction which mark them as the latest advance in the art of fuse manufacture:

The window is small in area, held in a metal eyelet, and inserted in the interior of the body and spun permanently in position. Venting features are provided in the molded fuse body and co-act with the window frame to make it a permanent structure of great strength.

**CLEARSITE** is the only non-renewable plug fuse to use the famous "Drop-Out" link. Its use results in a great reduction in internal operating pressure. It is mounted with the operative section of the element immediately under the window and has two additional restricted sections deep within the body and at right angles to the visible section.

When a **CLEARSITE** Fuse has not been blown the fuse link is plainly visible at a glance, and shows also the ampere capacity stamped on the link. When the fuse has blown on overload, a gap at the operative section may be seen clearly, for the window will be unaffected; when the fuse is blown on short circuit, view of the link will be hidden by the blackened window. The great value of this feature to both user and inspector is apparent.

The plug body is made of Economy heat-resisting molded insulation,—dead black in color. It is lighter and of greater strength than porcelain and eliminates breakage in handling and use. The circumference is fluted to give a sure grip for insertion and removal of the fuse; since only the insulation is exposed to touch there is no possibility of accidental electrical contact.

**4 for 25c** *Sold in standard carton quantities, and in retail packages of four, at leading electrical jobbers and dealers everywhere.* **4 for 25c**

## Economy Fuse & Mfg. Co.
**CHICAGO, U.S.A.**

A corner in one of the rooms in the Service Department of the International Trade Press, Inc.

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ADVERTISERS considering the use of International Trade Press publications are heartily welcome to the co-operation of our Service Department in preparing advertising matter.

This Department is maintained to give every possible assistance to advertisers. It specializes in putting forward the advertiser's idea in attractive illustration or typography and in inquiry-getting "copy." It is manned by artists and writers capable of handling technical subjects accurately and of putting into advertising a distinctiveness not usual in trade papers. In addition, the Service Department offers to advertisers the benefit of its experience in procuring high-grade engravings, at lowest cost.

We beg those who, soon or eventually, may take advantage of our exceptionally effective media to forward now such data as they consider useful in preparing suggestive advertisements.

International Trade Press, Inc.
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BATES Valve Bags
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HAS NO EQUAL
Our Capacity Ensures and We Guarantee
PROMPT DELIVERIES
From Stock
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THE STANDARD STEEL EVERYWHE
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**AMERICAN MACHINE & TOOL RECORD—**
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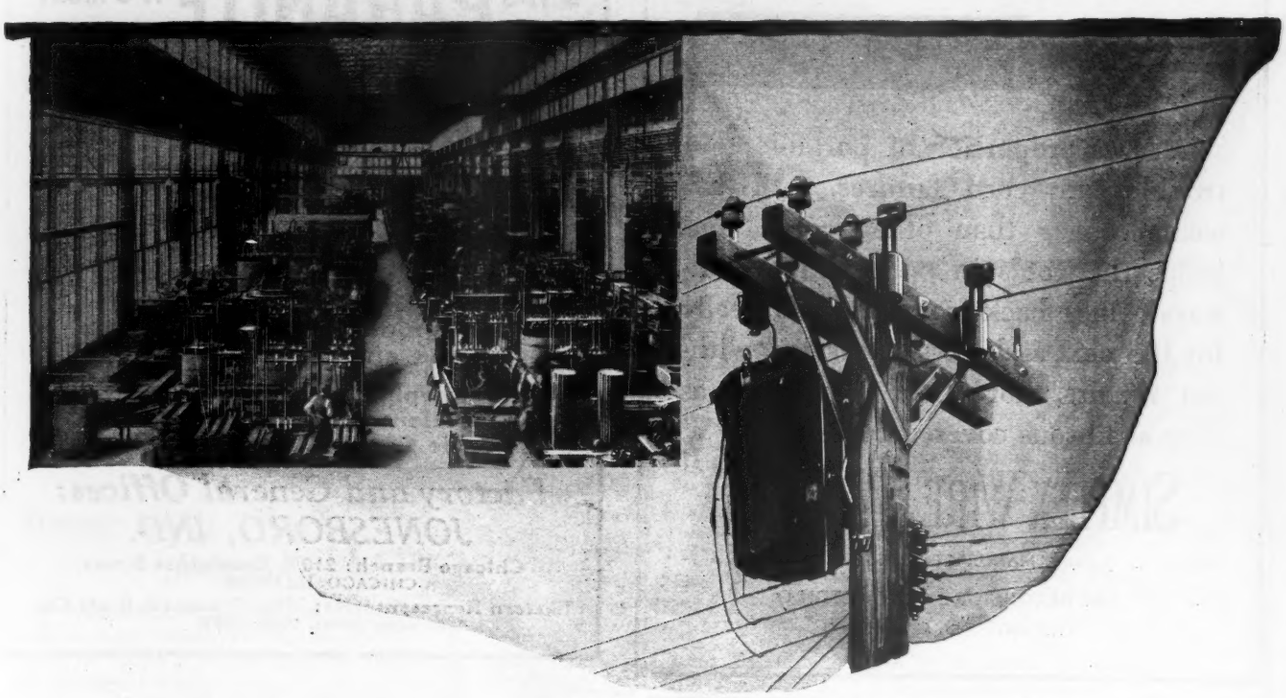

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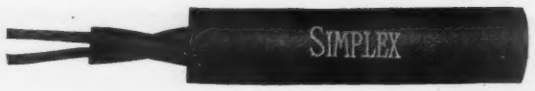


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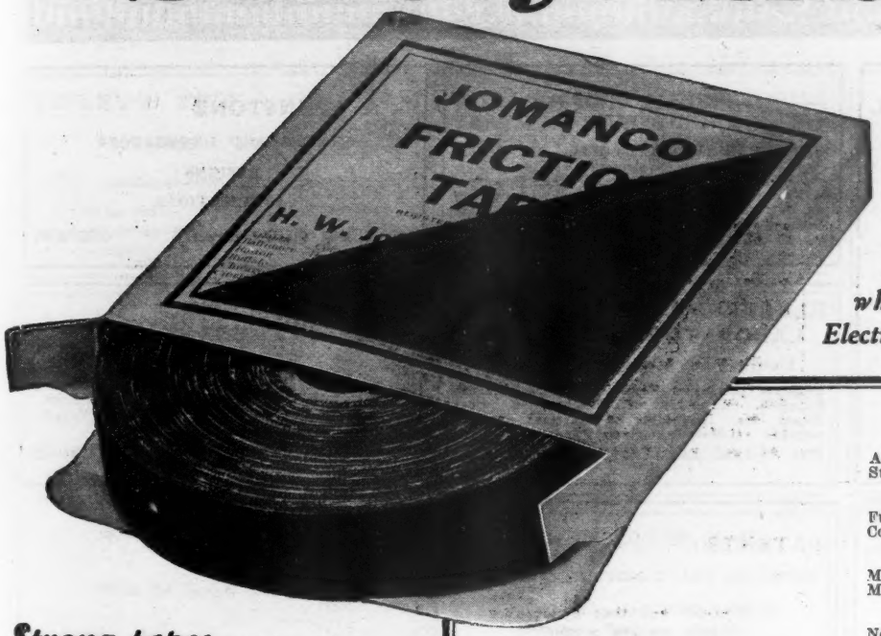


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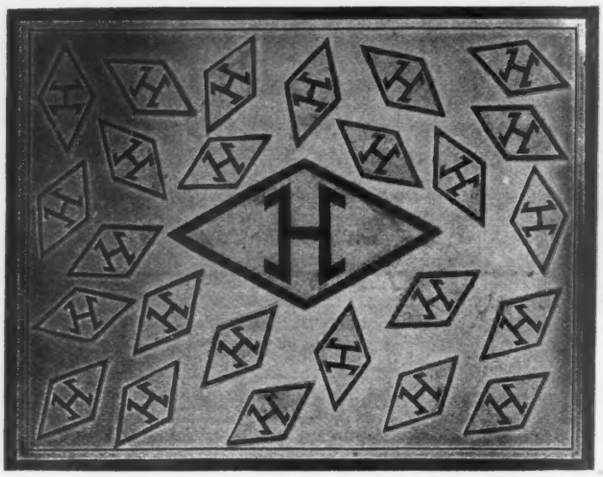


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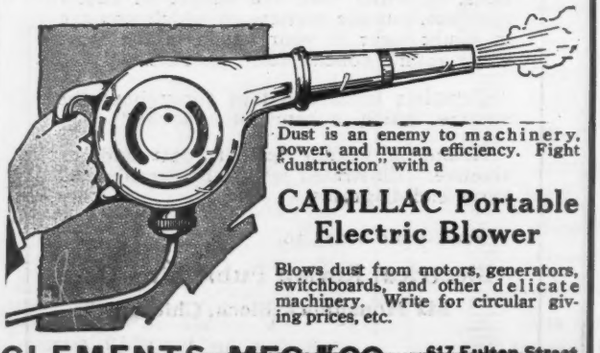

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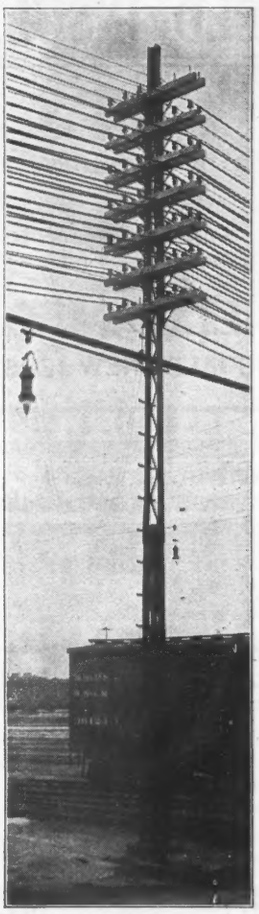

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Johns-Manville Co., H. W.
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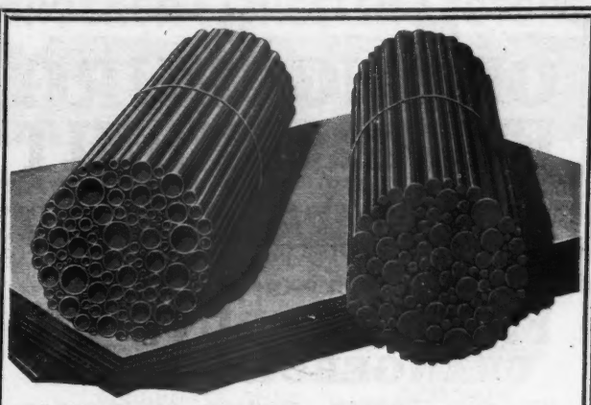

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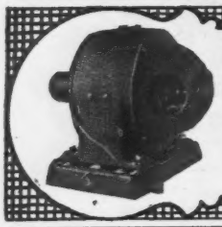

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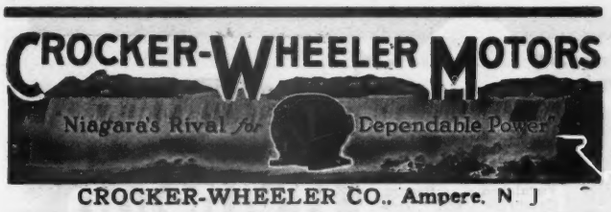

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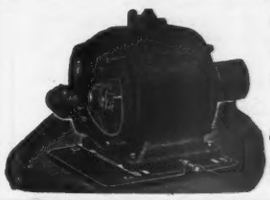

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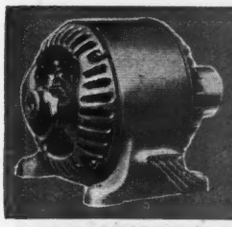

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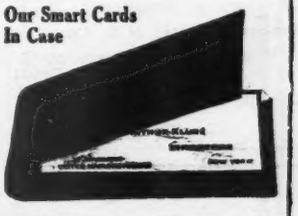

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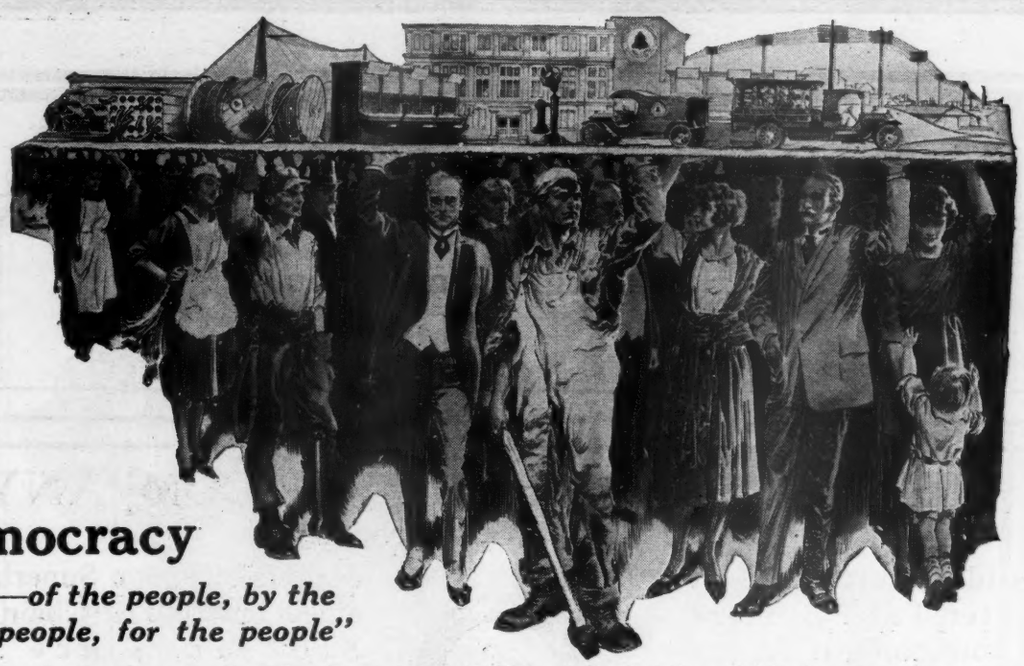

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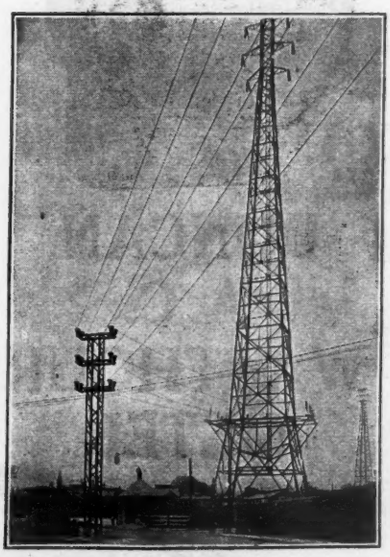

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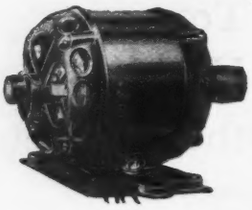

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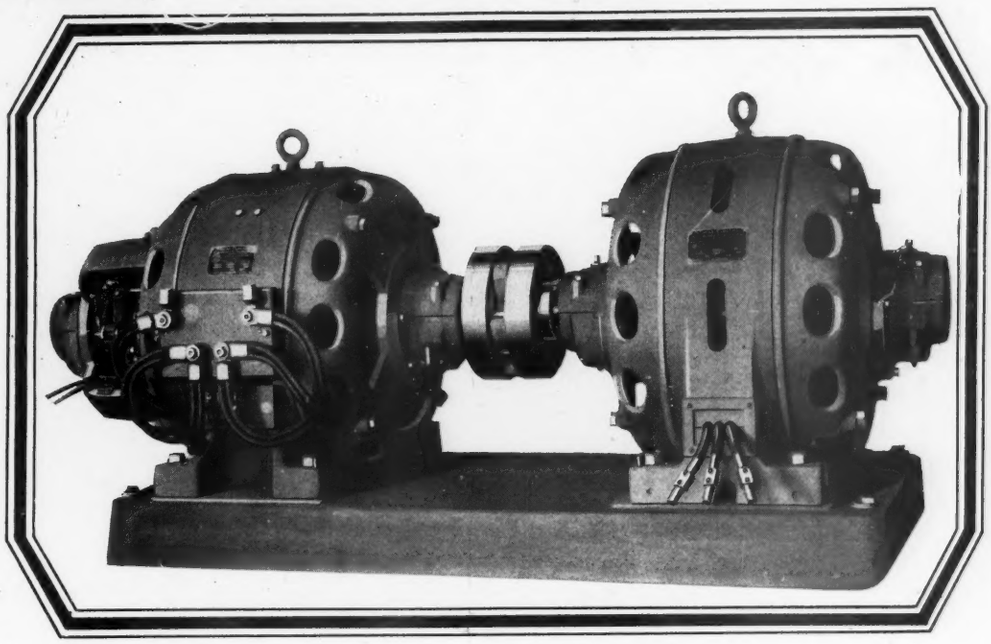

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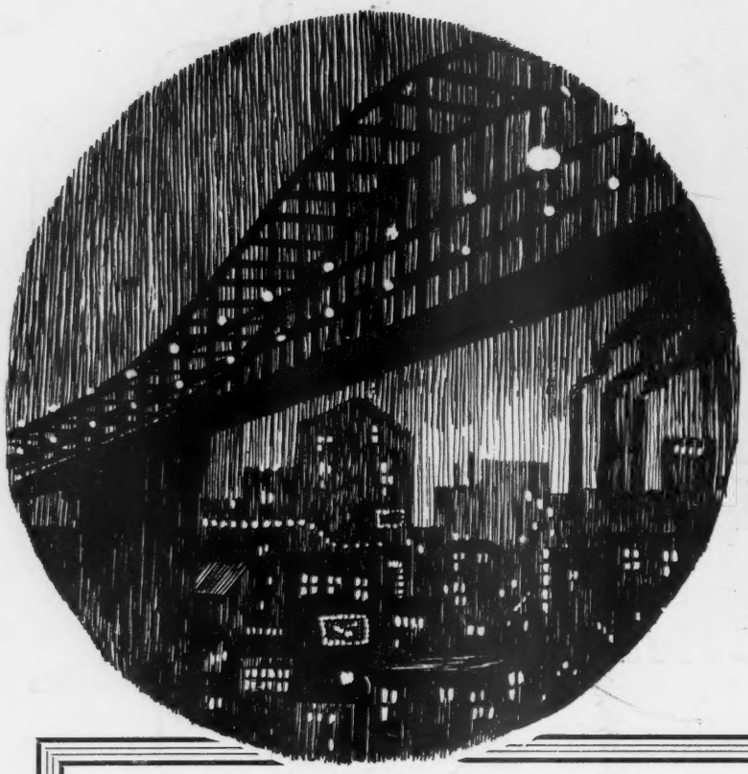

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